American Machinist

JUNE 5, 1947

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

In this issue

FUNCTIONAL PHOTOGRAPHY

SOUND REPLACEMENT PAYS

CHARTS DIAGNOSE QUALITY

WHERE PRECISION IS MAXIMUM YET PRODUCTION IS MODERATE

Here's how it's done on a Heald No. 48-A Bore-Matic

The customer's production requirements on this refrigerator piston and connecting rod job were moderate. He wanted low-cost manufacture with maximum precision.

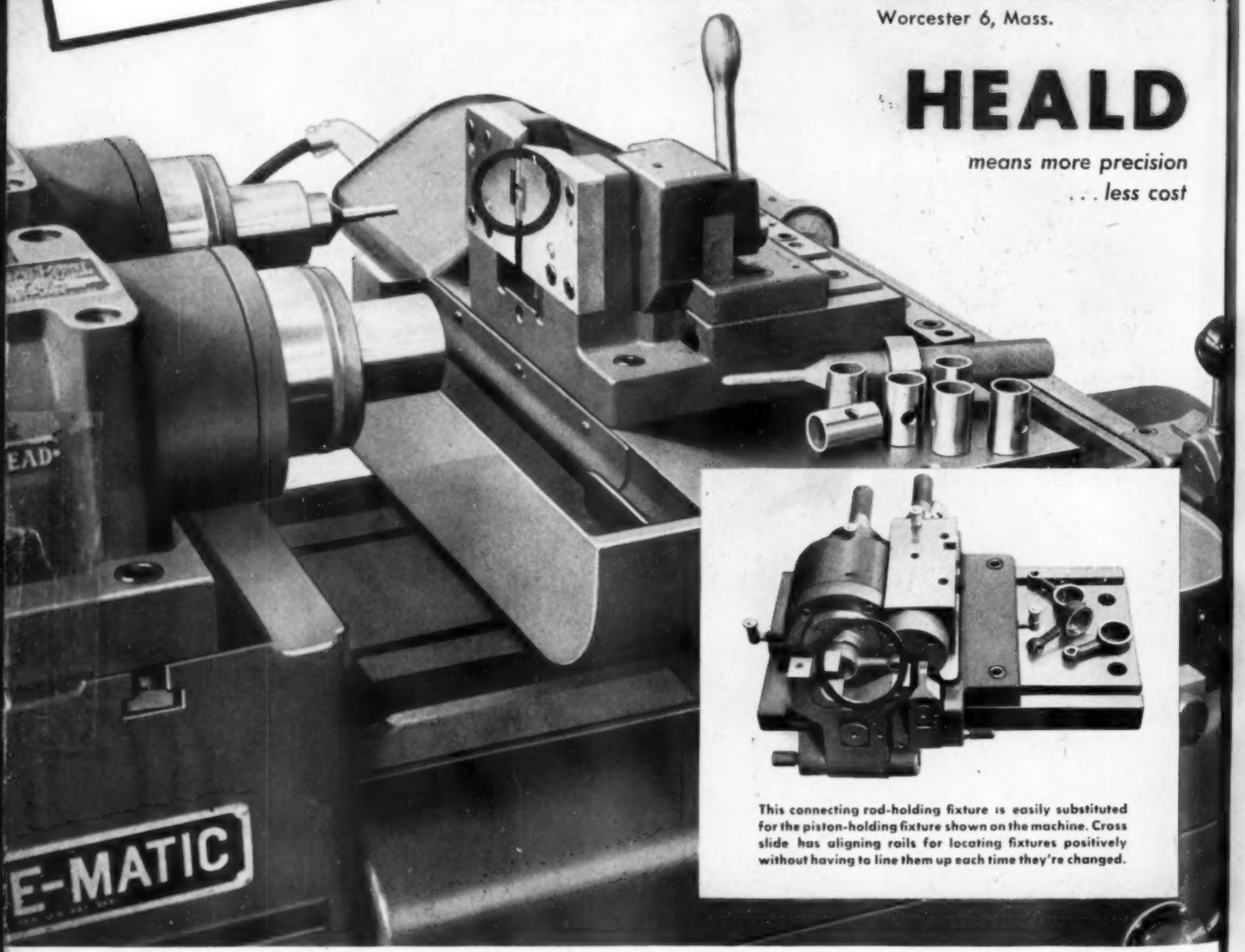
Heald engineers tooled up the No. 48-A Precision Bore-Matic shown below with two separate holding fixtures. One is for finish-boring the wrist pin holes in the pistons. And the other holds the connecting rods, in which the wrist pin hole is finished to a .0002" size tolerance and the crank bore to a .0005" tolerance.

Chances are, too, that the right Heald Bore-Matic can solve *your* precision finishing problems—on jobs involving boring, turning, facing, grooving, chamfering, and even forming—singly or in multiple machining operations.

For that's our business—developing *basic machining methods* to a high degree of accuracy and finish, and at whatever rate of production you specify. Why not let us show you how our business can help yours? Write to: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
. . . less cost



This connecting rod-holding fixture is easily substituted for the piston-holding fixture shown on the machine. Cross slide has aligning rails for locating fixtures positively without having to line them up each time they're changed.

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

American Machinist

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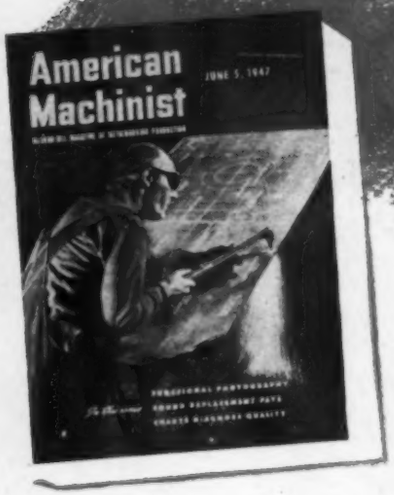


Chips and QUIPS

Complete Layout . . . The light-sensitive "Transfax" process permits a drawing to be printed on a sensitized surface so the image can be developed to remain stable. In our cover Kodachrome, taken by Eastman Kodak Company, a layout for fabricating a metal housing has been printed directly on the steel. Thus operators have complete details for shearing, bending, torch-cutting (as shown—lines do not burn off), drilling and other processing.

This picture illustrates one of the many ways in which photography is used functionally in Metalworking. Others are detailed in our special 16-page report in this issue, by Associate Editor LeGrand.

Remote Control . . . Some six or seven months ago, we presented our opinions on remote-control management. The article generated several discussions. Combined and amplified, they comprise our lead article. It is titled "Needed: Human Engineering." . . . For management also, we present Eugene Goddess again, this time describing the functioning of a statistical quality-control chart.

20-75 Plan . . . Some time ago, we reported in "Talking Shop" the machine-tool replacement plan by which a textile-loom maker would buy any unit that would save 20% and could be used 75% of the time, would consider any one that saved 10% and could be used 50% of the time. In this issue we detail the plan, as explained by O. V. Payne, works manager of Crompton & Knowles Loom Works, and cite examples of its application in purchase of $1,000,000 worth of machine tools last year . . . This story forms three of an added unit of four pages—duplicating the bonus in our previous issue . . . The fourth page argues for accelerated depreciation of machine tools to improve production efficiency.

Surface Finish . . . E. L. Hemingway of Gisholt has been performing some extensive research on effects of surface finish on bearings. The first report is presented herewith—with evidence.

Point Seer . . . Like the wartime censors on G.I. mail, the proofreader couldn't resist one crack about "Nothing Doing in Metalworking," our last-issue *Fictionary*. At the side of the solid-black final illustration, he wrote: "Au: Is this cut upside down? (That's a joke, Son!)." Incidentally, how the typist and the compositor ever got through that one we'll never know.

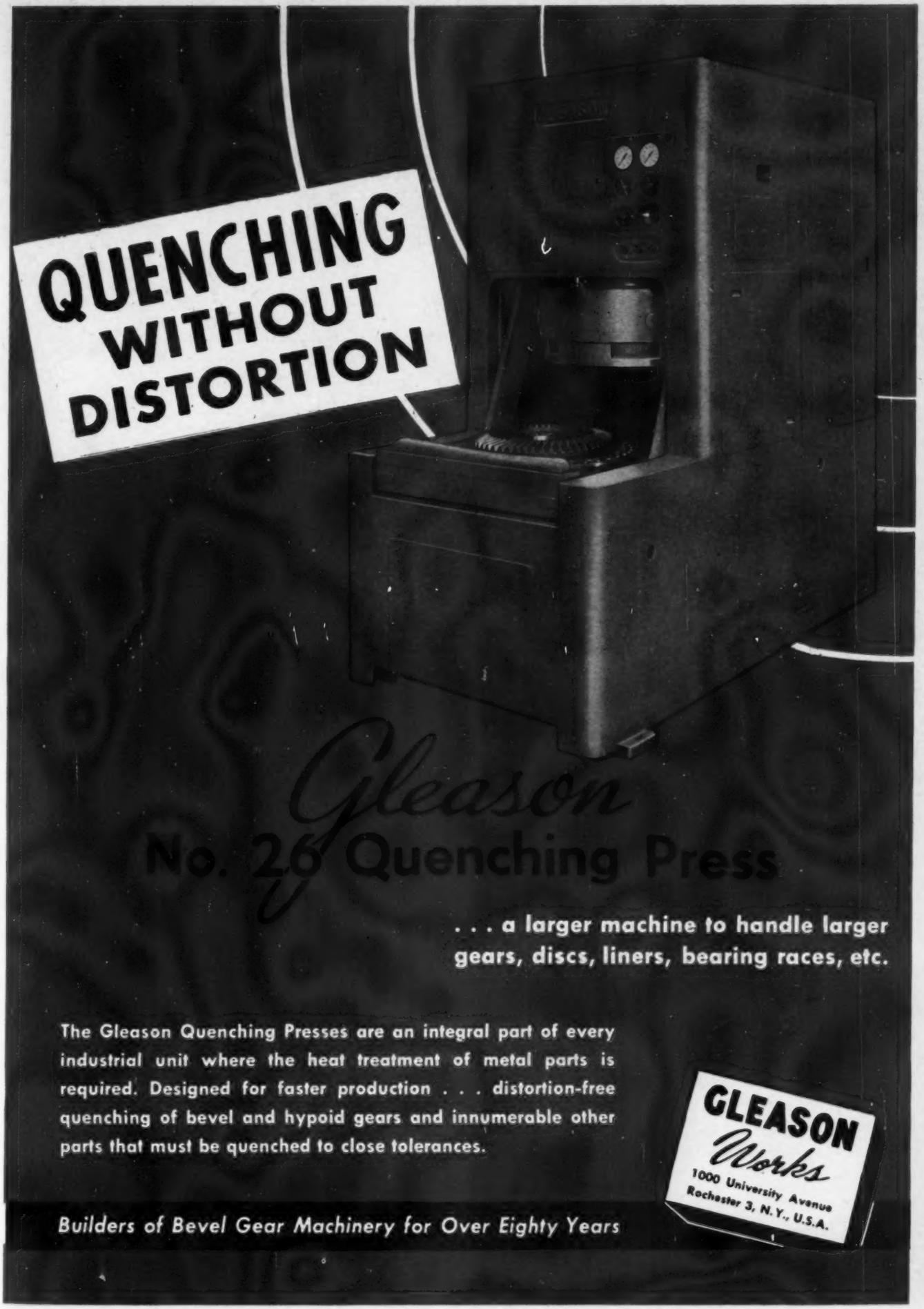
Welder Maintenance . . . Ryan Aeronautical uses preventive maintenance, with periodic inspection of some 75 units, mostly spotwelders. This issue includes the story.

For the Shop . . . In addition to other articles for production men, we include another group of Shop Shots (a favorite department), Part III of H. A. Frommelt's series on specifying machine tools for use with carbides, and an explanation of special milling setups for electric-razor parts at Collam.

Sales Leadership . . . Says Richard Grant: "A salesman, like the storage battery in your car, is constantly discharging energy. Unless he is recharged at frequent intervals he soon runs dry. This is one of the greatest responsibilities of sales leadership."

Coming . . . June 19 *A.M.* will include a special report on precision casting . . . G.E.'s method of sound-stylus control for a duplicator milling turbosupercharger impellers . . . Another Mills article, this time on drawing and redrawing thin sections . . . Characteristics of boron carbide, hardest man-made material . . . Dr. Sawin discussing calculations for accurate press fits on large pieces . . . Mechanized welding for space saving . . . Also ridge-forming Plexiglas and a Fictionary on Snakes.

IDEA MAN . . . Born in Cincinnati in 1922, James T. Van Voast, assistant editor, is our only Yale man. He was graduated in 1942 with a B.E., just in time to enter the Navy. There he had diesel school, then served on subchasers and a carrier, finally went to teaching "new" officers how to run an LST. After discharge as a junior lieutenant two years ago, he went to work in Magnaflux Corp.'s stress-analysis laboratory at M.I.T. The death of Prof. A. V. de Forest, who developed Magnaflux, Magnaglo and Zyglo terminated the activity, so Van Voast came to AMERICAN MACHINIST to take charge of our Practical Ideas section. His penchant for such hobbies as yacht design, Pennsy motive power and photography help him on the job. He also has turned out two special reports, the first on Electric Control for Metalworking Machines last Dec. 19, the second on Precision Casting. The latter one will appear in our next issue.



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No. 26 Quenching Press

. . . a larger machine to handle larger gears, discs, liners, bearing races, etc.

The Gleason Quenching Presses are an integral part of every industrial unit where the heat treatment of metal parts is required. Designed for faster production . . . distortion-free quenching of bevel and hypoid gears and innumerable other parts that must be quenched to close tolerances.

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Builders of Bevel Gear Machinery for Over Eighty Years

Need a

The taper shank cutters at the rear were made —or ground from the solid if you prefer—*from scrap*, on a CINCINNATI Monoset Cutter and Tool Grinder. The other cutters and the two "chessmen" were also ground on a Monoset.

● There's no need to tie up expensive production machinery while waiting for a cutter replacement. You can make the cutter right in your own shop on a CINCINNATI Monoset Cutter and Tool Grinder.

> Take a piece of suitable steel, or a larger broken or scrap cutter, grind it to shape, grind the flutes, and then sharpen in the conventional manner. *One chucking* does the whole job.

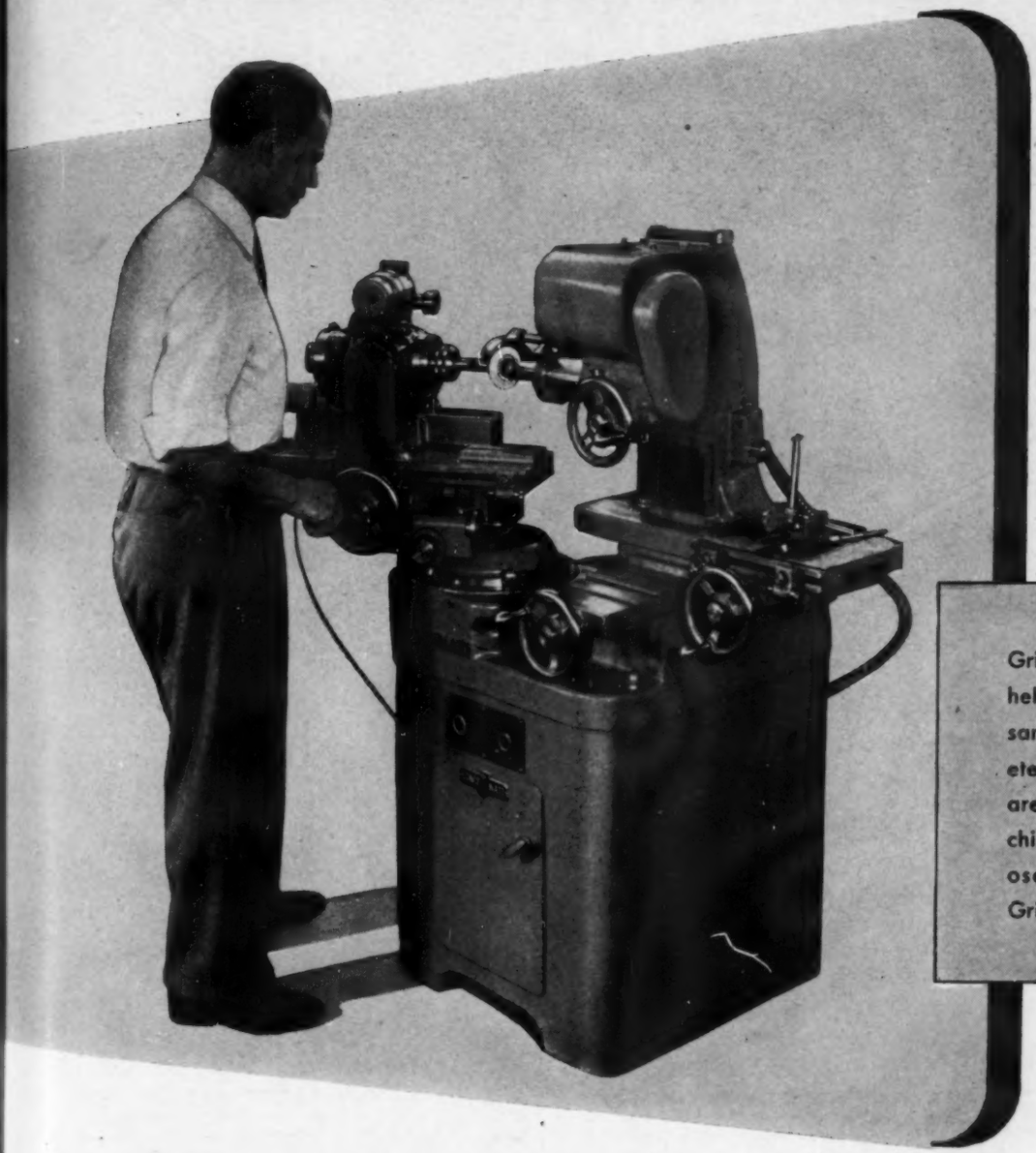
Small intricate cutters . . . the kind which you ordinarily order as special items . . . can readily be made in this manner. Because of its versatility in making cutters as well as in sharpening them, the CINCINNATI Monoset offers the possibility of quickly paying for itself. This is one of its many advantages. ¶Would you like to know more about the Monoset and how it grinds straight, taper, and ball-nose cutters? Write for catalog M-1386.

THE CINCINNATI MILLING

MILLING MACHINES

Special Cutter in a Hurry?

YOU CAN MAKE IT ON A CINCINNATI MONOSET



CINCINNATI

Grinding a radius on a helical end mill. At the same chucking, the diameter and face of the teeth are also ground. The machine is a CINCINNATI Monoset Cutter and Tool Grinder.

MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

Generating a hexagonal trim die on the No. 7125A High-Speed Fellows Gear Shaper with automatic tilting mechanism at the Cleveland Cap Screw Company.

● **GOVERNMENT SURPLUS MACHINE TOOLS:** We are licensed under the WAR ASSETS ADMINISTRATION to act as dealers in the disposal of Government Surplus Machinery. Those interested in obtaining such machinery should contact our Main Office, Springfield, Vt.; or our offices in Detroit, Mich. and Chicago, Ill.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

Taper Trim Dies

FINISHED IN 12 TO 14 MINUTES

★ High-Speed Gear Shaper Generates Square or Hexagon Contours for Bolt and Nut Dies Made From High-Speed Steel—To Accurate Specifications

Here is a case where the versatile Gear Shaper has been applied with speed in converting round holes into square and hexagon holes in bolt and nut dies. The face widths of these dies vary from ⅝ to 2¼ inches, and are made with both straight and tapered holes up to 2½ degrees.

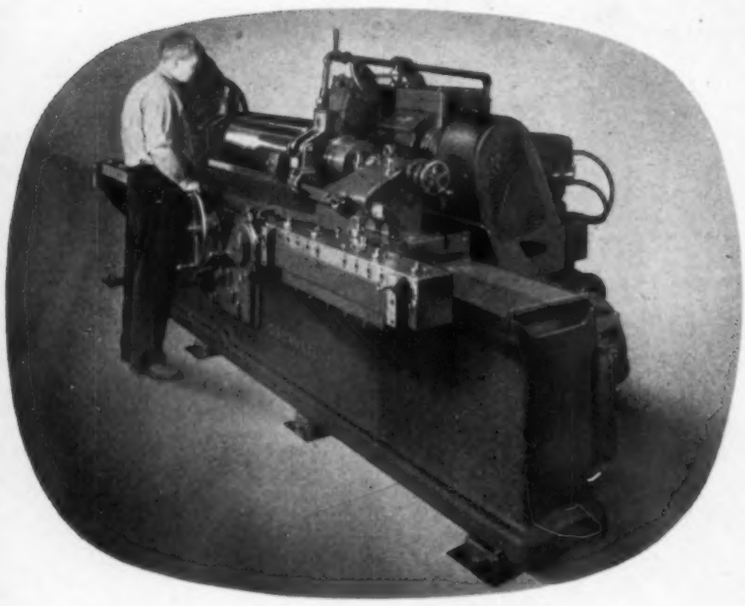
The ability of the Gear Shaper to generate symmetrical, or irregular contours, internal as well as external, carries suggestion to designers and shop men in a variety of industries. For a further indication of the wide versatility of the Gear Shaper, we suggest you ask for our 48-page illustrated book, "The Art of Generating With a Reciprocating Tool"...or better still, call in the Fellows Field Engineer on your production problems. The Fellows Gear Shaper Company, Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Building, Detroit 2, Mich....or 640 West Town Office Bldg., Chicago 12, Ill.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

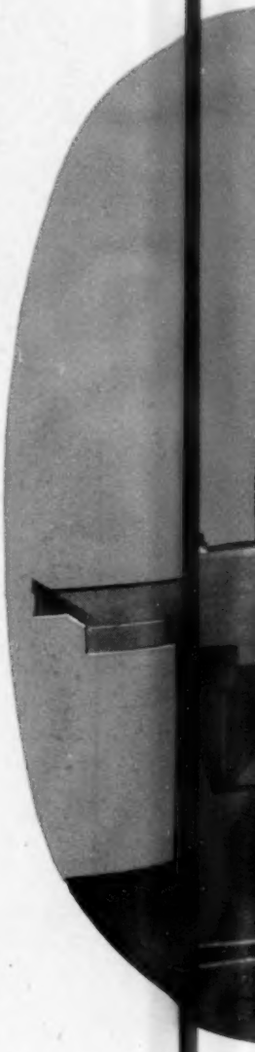
HIGH BRILLIANCE OF

Silver, gold and platinum alloys, rolled out to foil and strip thickness, are employed in the manufacture of costume jewelry, eyeglass frames, watch cases, etc. Quite naturally, rolling operations on these precious metals impose a very high degree of quality on the rolls, for the foil and strip must be exactly uniform in thickness, and there can be no subsequent polishing operations. To attain this degree of perfection, the rolls **must be ultra-accurate in all respects, with a surface finish of about ½ micro-inch.** ¶To meet these requirements, CINCINNATI Grinding Engineers equipped a CINCINNATI FILMATIC 14" Plain Self-Contained Roll Grinder with several special features which assure rolls of exceptionally high quality. The machine is employed not only for grinding new rolls, but also for regrinding worn rolls, when only a "tenth" or two is ground away. ¶If you grind small rolls for any purpose, cambered .0001" or several thousands, convex or concave, it will pay you to find out more about CINCINNATI FILMATIC 14" and 16" Plain Self-Contained Grinding Machines equipped for roll grinding. Write for catalog G-491-2.



CINCINNATI

Left: CINCINNATI FILMATIC 16"x72" Plain Self-Contained Roll Grinding Machine. Here, aluminum foil rolls are being ground to within .0002" for correct camber and parallelism. This view shows one of the sine-bar units to good advantage.



CINCINNATI GRINDERS

CENTER TYPE GRINDING MACHINES

COSTUME JEWELRY *starts here*

CINCINNATI FILMATIC 14" x 48" Plain Self-Contained Roll Grinding Machine, with the following extra equipment for grinding rolls for precious metals to a high degree of reflectibility and accuracy: variable speed drive to the grinding wheel; two-speed automatic slow-down motor for the table drive; coolant filter; specially accurate sine-bar crowning devices.

INCORPORATED

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Gives Y

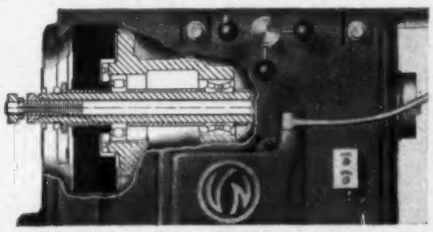
VAN NORMAN

No. 2 HEAVY

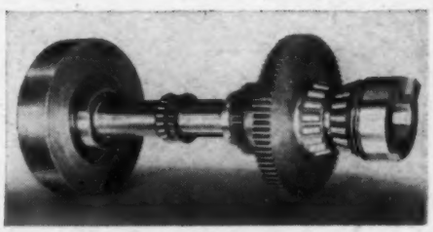
Horizontal Milling Machine

es You 4 Outstanding Features

That Improve Cutability, Simplify Operation, Increase Production

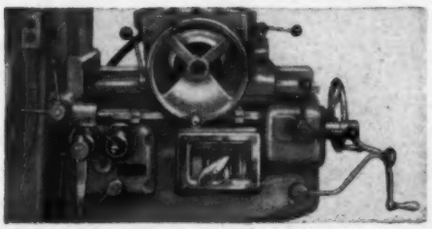


BUILT-IN SPINDLE FLYWHEEL, mounted inside the column, assures uniform uninterrupted transmission of power to cutter. The heavy flywheel increases and improves cutability . . . permits smoother finish of work surface.



5 ANTI-FRICTION BEARINGS support the large diameter alloy steel spindle. They maintain accuracy by assuring maximum spindle strength and rigidity under every type of cut.

EASE OF SPINDLE CONTROL is assured with single lever feed selector and convenient spindle reverse. Spindle clutch lever for starting and stopping spindle is quickly adjusted to most convenient operating position.



FRONT AND REAR CONTROLS of finger-tip power and six-way rapid traverse levers and manual adjustments simplify operation . . . reduce worker fatigue. Directional power controls provide maximum work and operator safety.

Look into the Van Norman No. 2 Heavy for general purpose and production milling. This heavy, rugged, highly efficient machine will give maximum quality service, increase production, lower costs on a wide variety of applications. Available with plain or universal saddle. Write for information.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

For Turret Lathe Operations —

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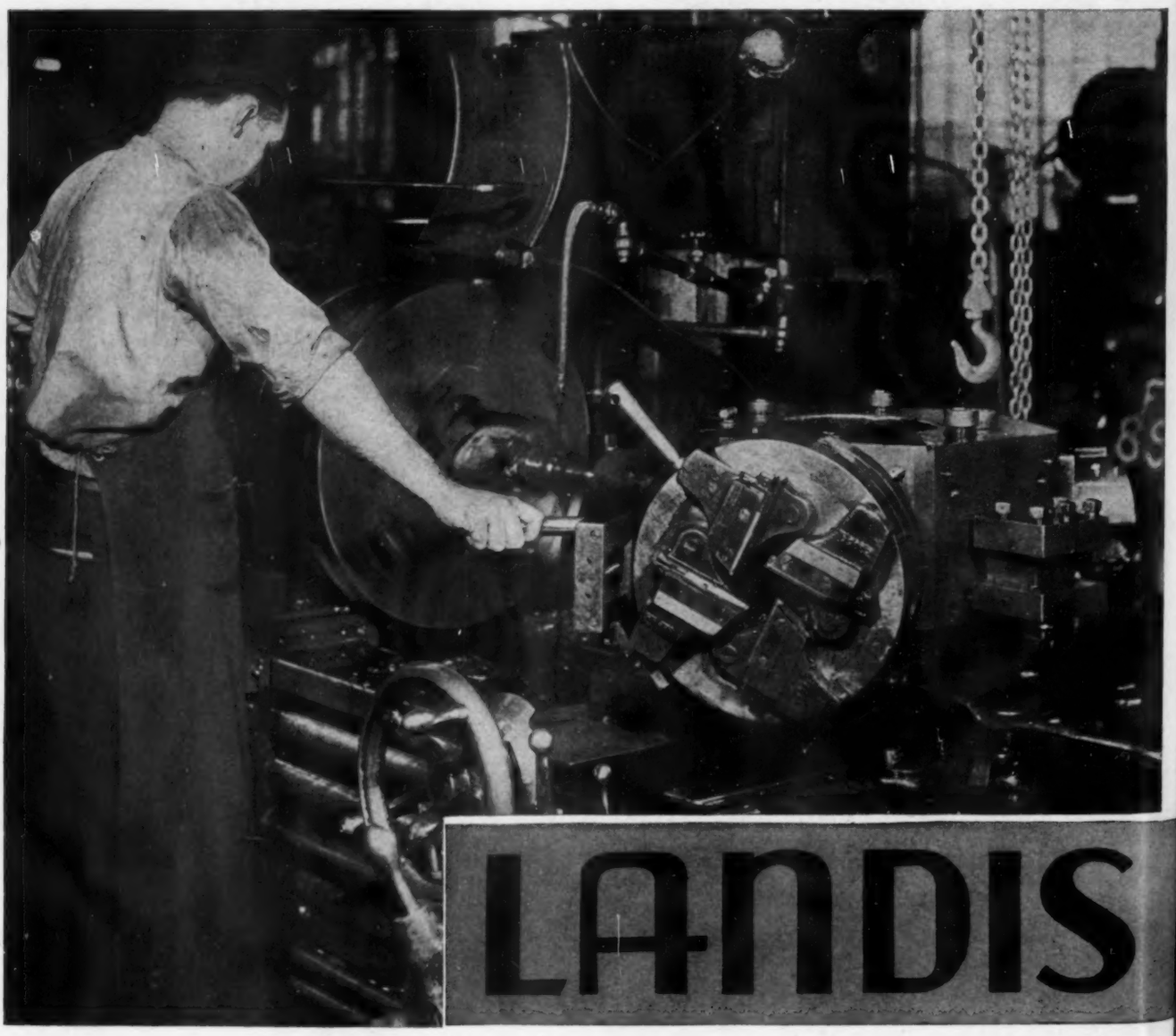
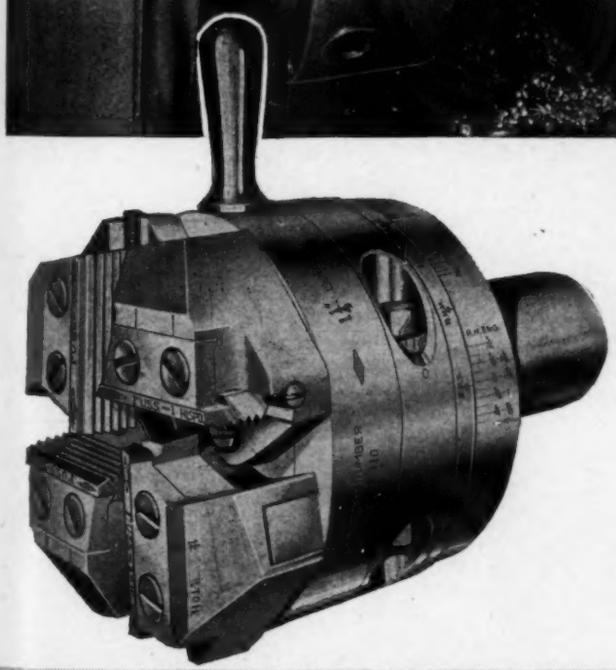
The Landmatic Head is designed especially for use on turret lathes. Its sturdy rigid construction assures high operating efficiency and fine thread accuracy.





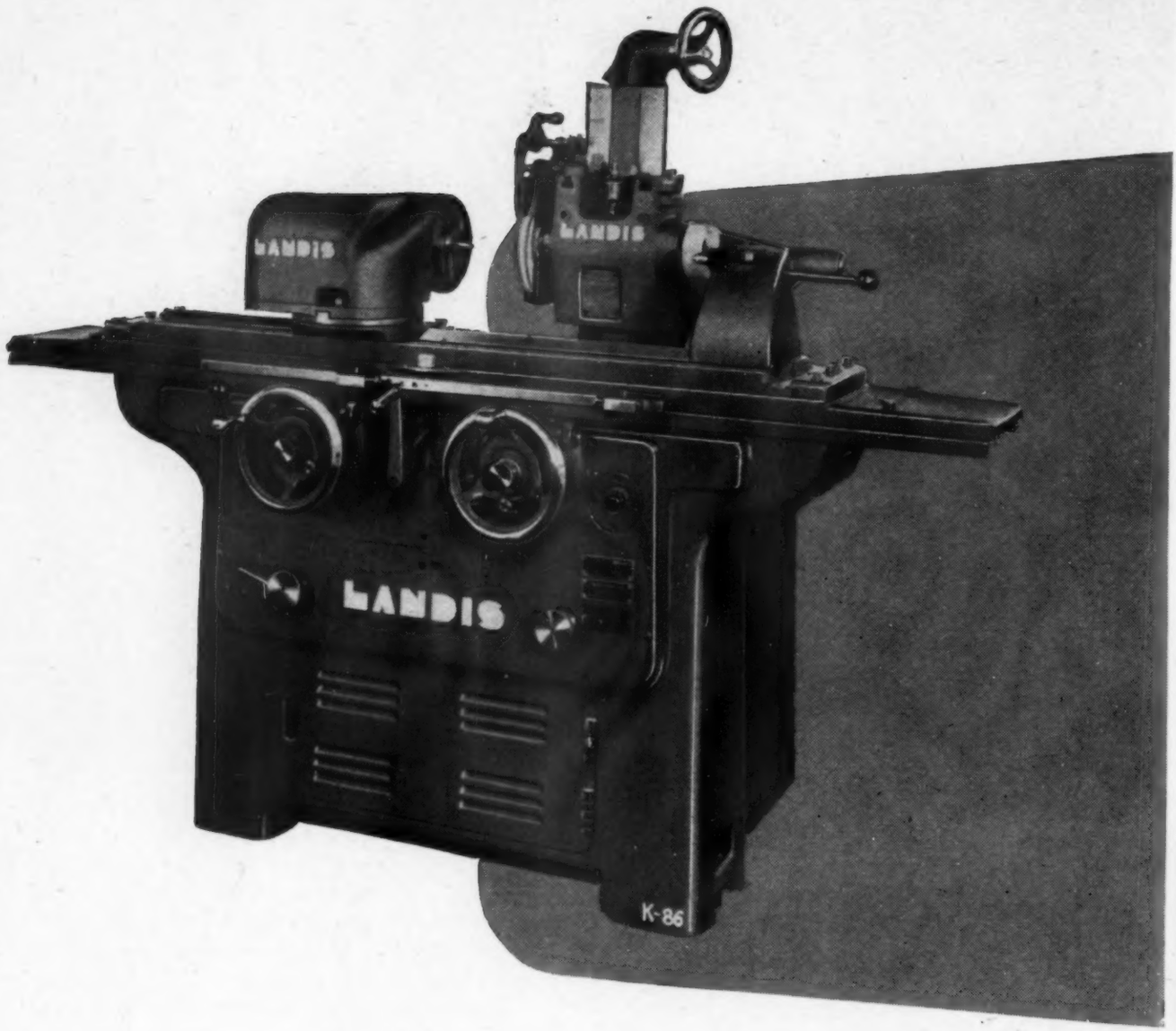
An eastern manufacturer of Gas, Steam, Air and Water Valves employs Landmatic Heads exclusively for threading Seat Rings and other valve components. Threads ranging in size from 1½ inches to 5 inches in diameter are cut with Landmatic Heat Treated Die Heads with an average saving of 30% of the cost of methods previously used. In the words of the manufacturer, "Figures definitely prove that Landmatic Heads are doing a BETTER job for us." Perhaps they may likewise do a better job on YOUR Turret Lathe Threading Operations.

Write for Bulletin F-90

MACHINE CO. WAYNESBORO PENNA. U.S.A.

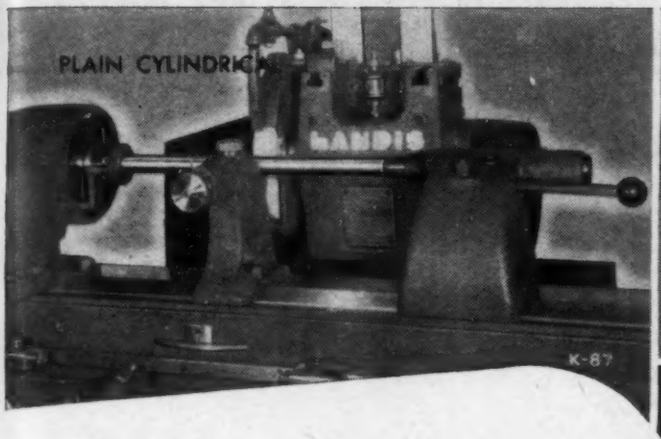
24 Different Precision Grinding Operations

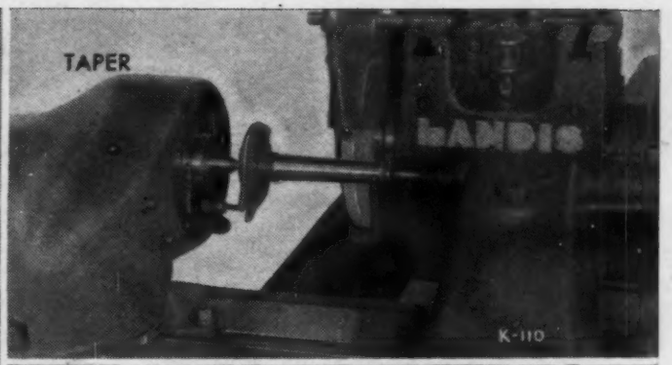
can be done on 12" x 28" universal and tool

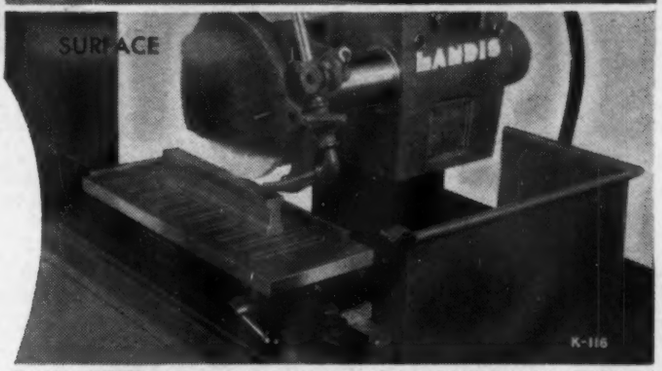


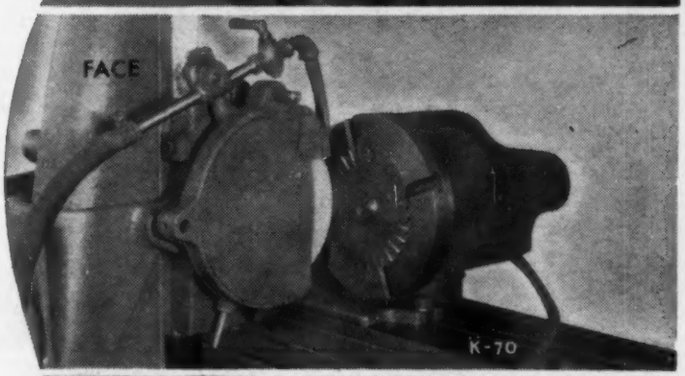
LANDIS TOOL *Precision Grinders*

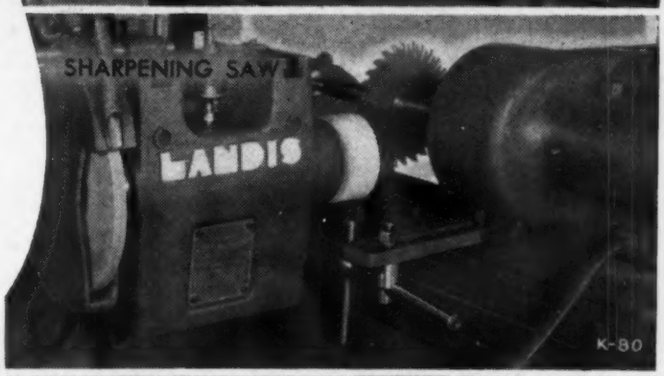
for detailed information, request catalog K-45

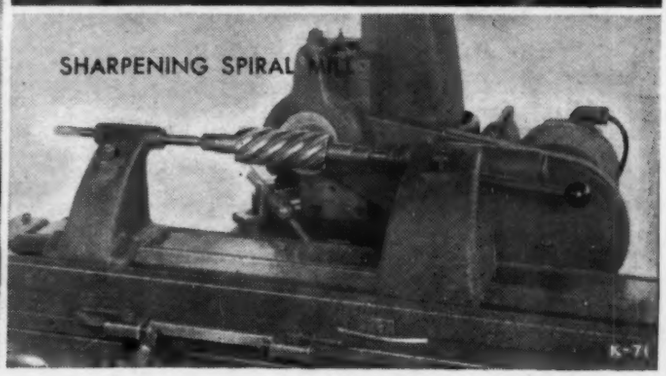












With Standard Equipment

1. **Cylindrical**
2. **Taper**
3. **Face**
4. **Surface** *(operations without attachments only)*
5. **Clearance on Saws, Cutters and Reamers**
6. **Flutes on Taps**
7. **Face of Teeth on Formed Cutters**
8. **Spiral Mill Grinding**

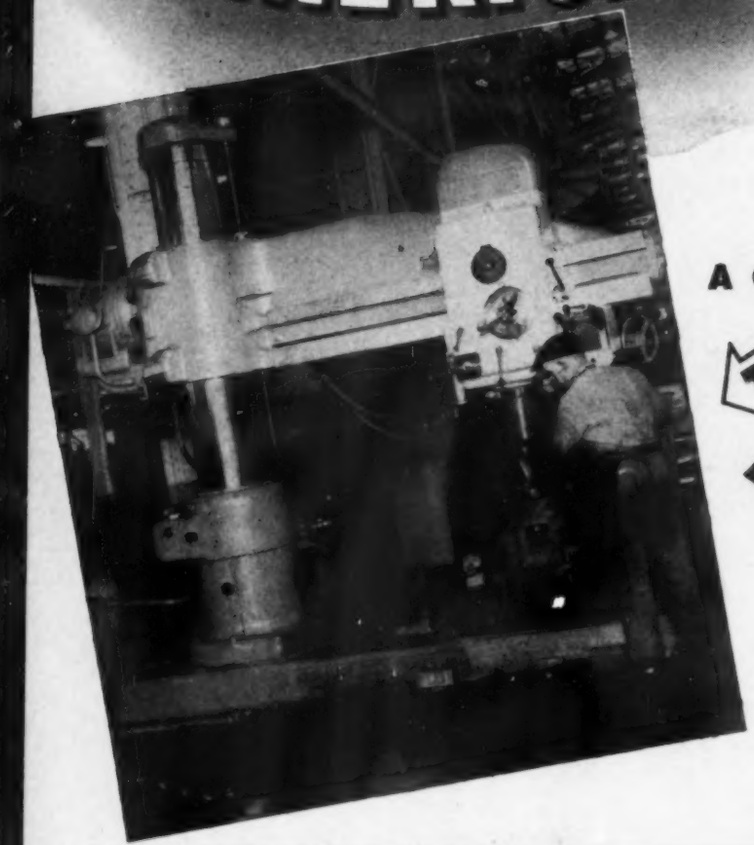
With Optional Accessory Equipment

9. **Milling Cutters**
10. **Wet Grinding**
11. **Dry Grinding**
12. **Internal Grinding**
13. **Hobs** *(right or left hand)*
14. **Parallel Blocks, Flat Forming Tools and Dies**
15. **Surface Grinding** *(quantity lots)*
16. **Screw Machine and Other Forming Tools**
17. **Angular Wheel Face**
18. **Reamers, Taps and Form Cutters**
19. **Gear Cutter** *(staggered or straight teeth)*
20. **Cylindrical Work Requiring Work Rest**
21. **Face Mills** *(up to 18½" diameter)*
22. **End Mills** *(with taper holding attachment only)*
23. **Drills** *(from 3/32" to 1½" diameter)*
24. **Saws** *(from 7½" to 26" diameter)*

LANDIS TOOL COMPANY, WAYNESBORO, PA.

"AMERICAN" Versatility

An Asset in the Railroad Shop!



A QUICK CHANGE FROM

THIS

...toTHIS

This "American" Hole Wizard Radial in the C. & O. R. R. Shops at Huntington, W. Va., seems to be a "jack of all trades."

As shown by the accompanying illustrations, one minute it's reaming cross head fits, the next it's on an emergency job drilling $\frac{3}{4}$" holes.

The Hole Wizard's wide range of speeds, its concentration of all controls at the head, its patented Double Lo-Hung Spindle Drive, great power and rigidity make it an outstanding machine for both production jobs and miscellaneous work of various kinds.

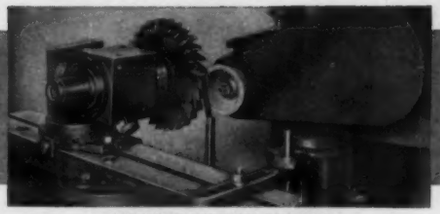
THE "AMERICAN" HOLE WIZARD IS A BULWARK OF PRODUCTION IN THE SHOP.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

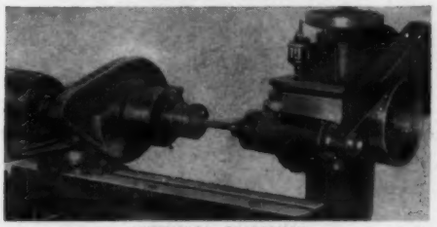
Lathes and Radial Drills

EXCEL



MILLING CUTTER GRINDER

FORM TOOL SHARPENING



INTERNAL GRINDING

CYLINDRICAL GRINDING

REAMER SHARPENING

NO. 6 "PAYS OUT" *FASTER* on all'round tool room grinding

FOR SMALL SHOPS—Owners find that the EXCEL pays out in a hurry on tool and cutter grinding. Its initial cost is low. It'll handle every tool room grinding job you're likely to have. With speed, precision and quality built in—the EXCEL also serves as a short-run production grinder.

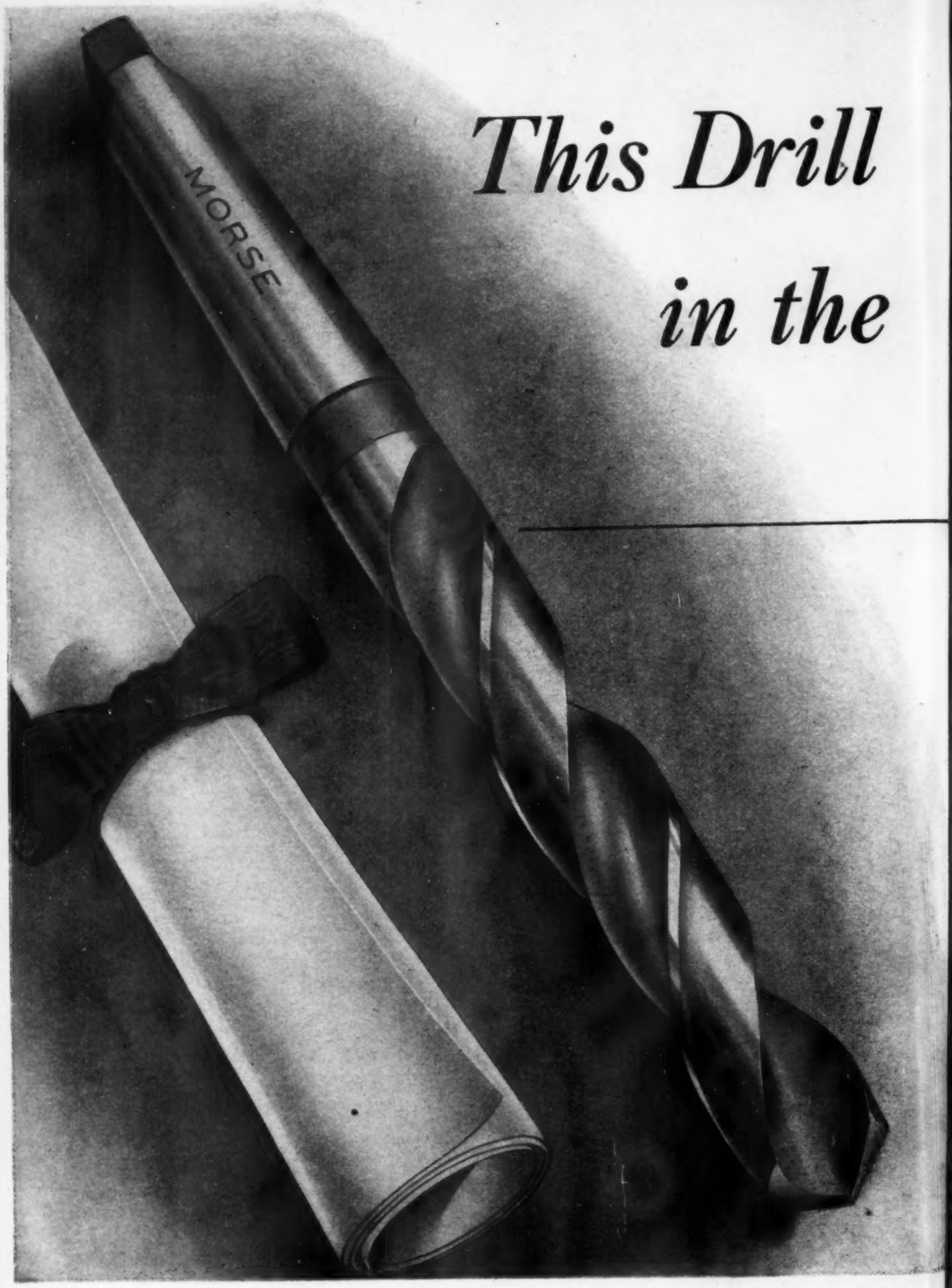
FOR BIGGER SHOPS—The EXCEL'S versatility adds a lot of tool maintenance capacity in very little space. You'll be surprised how often you'll put it to work as a tool room expediter.

There's an EXCEL dealer near you. Ask us for his name TODAY — and for Bulletin A-117 giving full details on the EXCEL Model 6.

MANUFACTURED BY
COVEL MANUFACTURING CO.
BENTON HARBOR MICHIGAN

EXCEL

This Drill in the



Graduated with Honors "College of Hard Knocks"!

MORSE FORGED TAPER SHANK DRILL
Forged for Toughness—
Milled and Ground to Morse Precision Standards

Here's a drill that offers a "liberal education" in serviceability and cutting efficiency. It's forged for strength and toughness, then milled and ground to the precision accuracy that's typical of all Morse tools. In addition, the *helix angle* selected for this drill is the result of long study to obtain greatest efficiency for cutting operations.

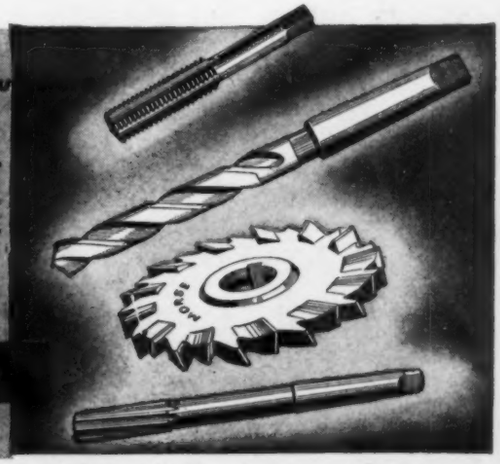
All these features *combined* provide you with an all-purpose drill that will earn its keep many times over—whether drilling gear forgings, connecting rods, crankshafts, cast iron, chrome nickel steels, etc. Buy this drill—it'll fill your bill! Your Industrial Supply Distributor can supply you.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manu

MORSE TWIST DRILL & MACHINE COMPANY

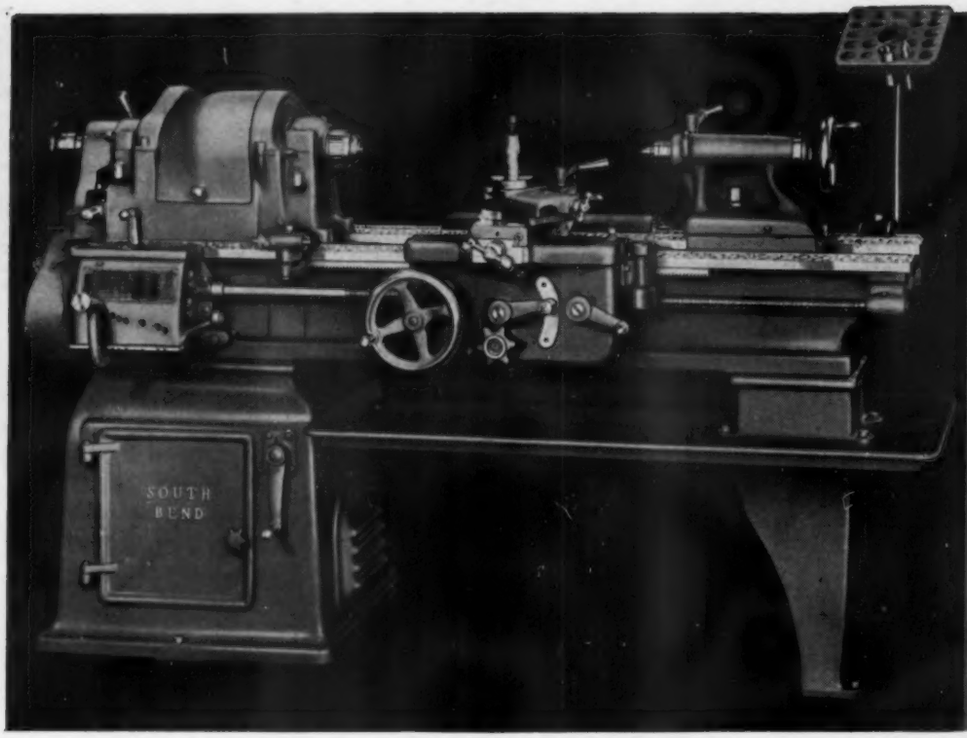
The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS



York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.

SOUTH BEND 16" PRECISION LATHES

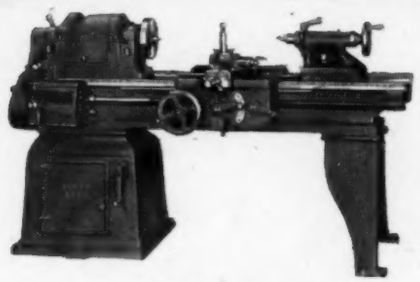


-for Better Toolroom and Production Work

16" x 6' South Bend Precision Toolroom Lathe **$1958.00**

The accuracy and versatility of South Bend 16-inch Swing Lathes improve the quality of toolroom work, facilitate tooling, and save machining time. Toolmakers like them. These same features — plus their large capacity, ease of operation, and dependability—step up production work. All these advantages make possible the manufacture of better products at lower costs.

In addition to the lathes shown, South Bend Engine Lathes and Toolroom Lathes are available with 9", 10", 13", and 14½" swings. Also Precision Turret Lathes with ½" and 1" maximum collet capacities. Write for catalog, stating the size lathe in which you are interested.



16" x 6' South Bend Precision Engine Lathe **$1567.00**

16" x 12' South Bend Precision Engine Lathe **$1863.00**

Prices are f. o. b. South Bend, do not include electrical equipment, and are subject to change without notice.

Features and Specifications of 16" Precision Lathes

Toolmakers like them

Swing Over Bed and Saddle Wings	16¼"
Swing Over Saddle Cross Slide	9⅝"
Bed Lengths	6, 7, 8, 10, and 12 feet
Distance Between Centers	33½" to 105½"
Spindle Speeds (8)	21 to 725 r. p. m.
Power Longitudinal Feeds (48)	.0015" to .0841"
Power Cross Feeds (48)	.0006" to .0312"
Thread Cutting (48 pitches)	4 to 224 per inch
Maximum Collet Capacity	1"
Spindle Bore	1⅜"
Cross Slide Travel	10½"
Compound Rest Top Slide Angular Feed	3¾"
Tailstock Spindle Feed	5¾"
Tailstock Top Set-Over	1"

BUILDING BETTER LATHES SINCE 1906

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • SOUTH BEND 22, INDIANA

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

The Boston and Maine Railroad is washing cars automatically at the rate of one a minute between revolving brushes with a water spray.

get ready with CONE for tomorrow

The sound-on-wire principle has been applied to a unit made by Sound Media to be used with billboards or displays.

be ready with CONE for today

Permanete Metals Corp. is experimenting with a magnesium blasting powder that is said to be insensitive to shock and not ignited by sparks.

get ready with CONE for tomorrow

The new Bendix-Stromberg carburetor compensates for changes in atmospheric pressure as in mountain driving.

be ready with CONE for today

Bendix Radio Division's new Type PAR-3 receiver weighs only one and a half pounds and is particularly suitable for small aircraft.

get ready with CONE for tomorrow

New York City's Third Avenue Transit Corporation is shifting from rail cars to buses and will use 700 General Motors 44-passenger diesel buses.

be ready with CONE for today

An electronic "stop watch" developed at Yale University is said to measure the speeds of particles accurately to a thousand millionth of a second.

get ready with CONE for tomorrow

Hudson Products Co. of Detroit makes a grinder with a 3-inch silicon-carbide grinding wheel driven by a water motor that can be attached to any faucet.

For crippled veterans, International Business Machines Corp. has devised an electrically operated artificial arm.

get ready with CONE for tomorrow

North American Phillip Co. is developing an arc welding technique that can be used by unskilled workers.

be ready with CONE for today

Aerojet Engineering Corp. predicts the use of its rocket power for the stopping and starting of heavy machinery.

get ready with CONE for tomorrow

The Bureau of Standards has a new gel capable of detecting one part in 500 million of CO.

The Whiting Corp. of Harvey, Illinois, has an electric hoist that will lift a ton but weighs only 87 pounds.

be ready with CONE for today

American Gas Accumulator Co. is making an inexpensive, breakable runway light for airports that shatters, if struck, without damaging the plane.

get ready with CONE for tomorrow

Dow Chemical Co. has used a solution of calcium chloride to freeze-proof carloads of coal in transit.

be ready with CONE for today

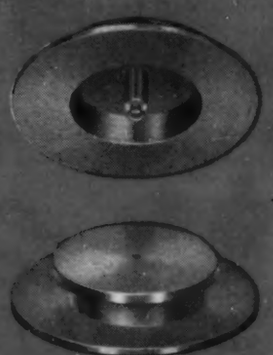
Diamond Instrument Co. is making a portable seismograph, particularly for highway surveys and constructions.

get ready with CONE for tomorrow

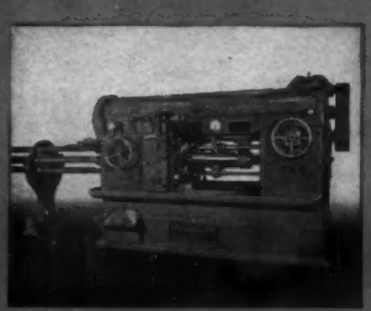
New Hampshire Ball Bearings Inc. is the first in this country to put the new ultra-small precision ball bearings into mass production.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Give *ordinary* jobs to any automatic. Put the *special* ones on a CONE.



From 1¼" dia. SAE 1112, a 6-Spindle Conomatic, with 11 tools, produces the piece shown in 56 seconds.



Ask your* CONE *representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

40

An example of mass grinding at a greater profit.

Six ensilage knives are held on a 36" magnetic chuck of a No. 18 Blanchard Surface Grinder. The materials, combining mild and tool steel, make this one of the most difficult of grinding jobs. Size of the piece, and tolerance are as shown in the sketch.

Average stock removal is .020" each side. Both sides of the knife are Blanchard ground.

Production is 24 pieces (48 surfaces) per 50-minute hour. This includes loading and unloading time.

FOR FLAT SURFACE GRINDING AT ITS HIGHEST EFFICIENCY

More than 30 years of concentration on the most efficient solution of flat surface grinding problems is our greatest asset—and one which we'll gladly share with you, without obligation on your part.

You may be sure that the recommendations that we make will be the most profitable solution of your metal removal problems . . . that our production data are reliable . . . that any Blanchards that you may buy will do everything that we say they will.

A Blanchard service that you may not know about is "SAMPLE GRINDING." Full details of this service are given on Page 77 of the Blanchard book illustrated below. Ask for your free copy.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

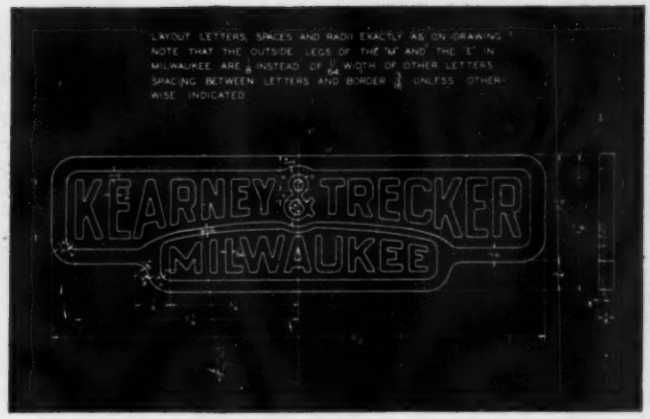
BLANCHARD

The BLANCHARD MACHINE COMPANY

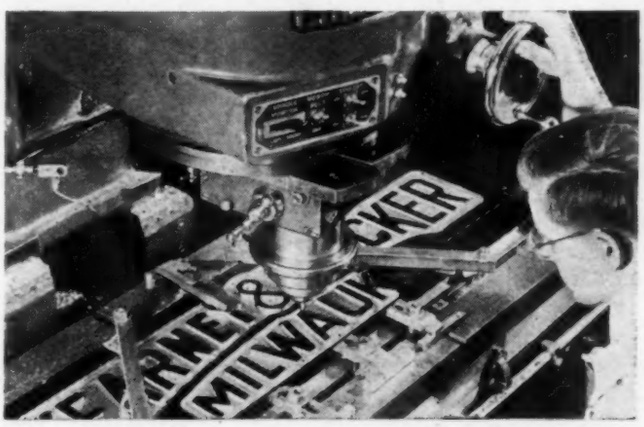
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Here's How to Make a Name for Yourself —in 55 Hours!

FAST! Here's 2 metal pattern jobs that ordinary methods take lots of time and effort to produce. Using a Rotary Head Milling Machine, they were simplicity itself. Operator accurately located each workpiece and one working center. The rest was simply following blueprints and simple arithmetic.


LAYOUT LETTERS, SPACES AND RADII EXACTLY AS ON DRAWING
NOTE THAT THE OUTSIDE LEGS OF THE 'M' AND THE 'E' IN
MILWAUKEE ARE 1/4 INSTEAD OF 1/4 WIDTH OF OTHER LETTERS
SPACING BETWEEN LETTERS AND BORDER 1/4 UNLESS OTHERWISE INDICATED
KEARNEY & TRECKER
MILWAUKEE

DIRECT! Regardless of jobs — pattern molds, tools, dies, hobs, cavity molds or production parts, the Rotary head milling machine transmits the blueprint dimension direct to the workpiece. No fussing with templets or models. Operator relies on simple, precise control of cutter and table movements.



ACCURATE! Machine features precision control of all cutter movements in any plane — enables operator to accurately locate and generate complex angles and contours. It reduces chance for error, because most jobs, even if somewhat large or complex can be completed in one or two set-ups.

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN

The Kearney & Trecker-Milwaukee Rotary Head Milling Machine offers a conservatively estimated 35% savings in use on a major percentage of tool, die, mold, or production work within working range. For complete data write for bulletin 1002C

Sheave to Transmit 1400 Horsepower...

...or a Belt for a 1/4 hp Compressor!

CALL ON THE TEXROPE LINE for the *best* in V-belt engineering and V-belt equipment. That has been true for 22 years — ever since Allis-Chalmers originated the Multiple V-belt drive for industry.

Back of every *Texrope* installation — from fractional horse power V-belts that manufacturers put on washers, air-compressors or water systems—to the biggest V-belt drives ever designed and successfully applied—stands the finest V-belt engineering talent in the world.

There's no substitute for this vast experience and tremendous fund of knowledge. It is reflected in every *Texrope* product.

What do *you* need... a few V-belts and sheaves — or a daring new application of the multiple V-belt principle? Call on the *Texrope* line! Equipment and engineering help are as close as your nearest A-C sales office or dealer. ALLIS-CHALMERS, MILWAUKEE.

A 2187

TEXROPE ..Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.

SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

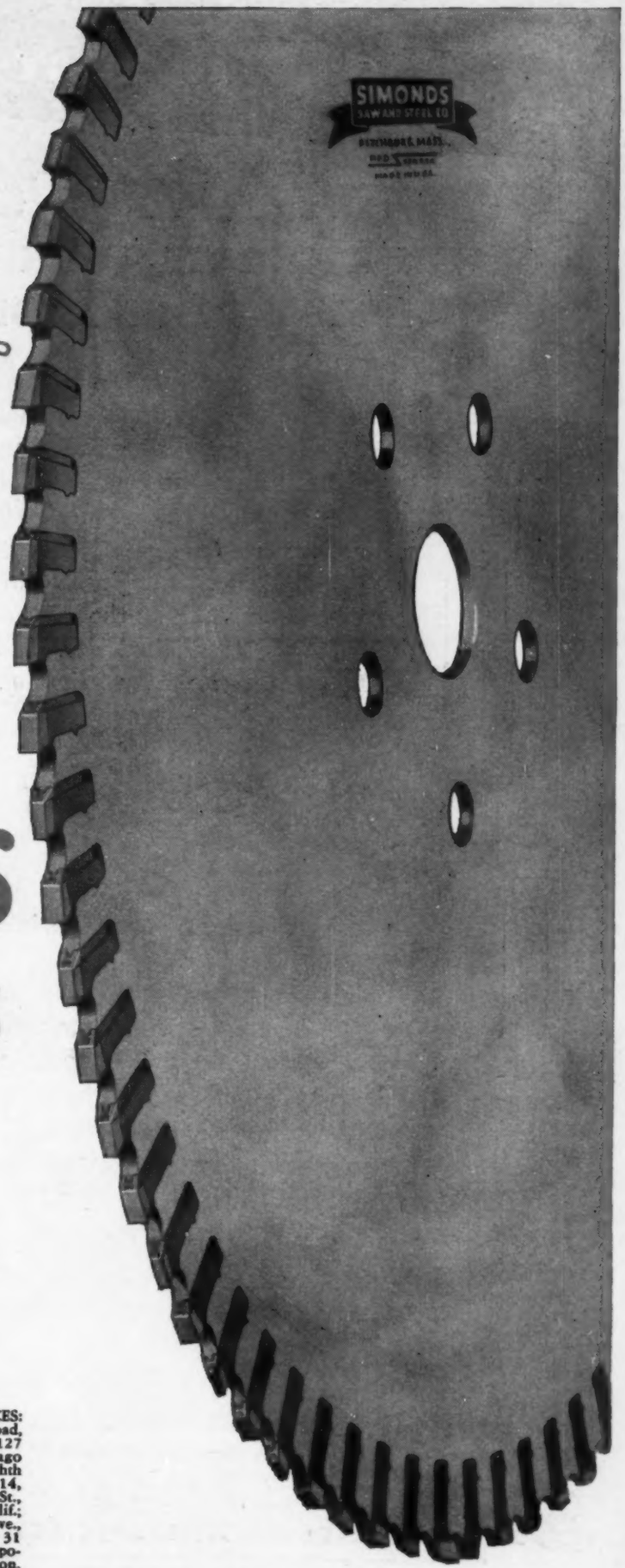
ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

ALLIS·CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great



. . . the *Original* Saws with the
CURVED-GULLET TEETH
that permit Faster Speeds
and Feeds . . . Deeper Cuts

SIMONDS

Inserted-Tooth METAL-CUTTING Saws

Curved-gullet design . . . together with alternating square and bevel teeth . . . prevents welding of chips to the saw-plate. Each tooth is held in place by its own separate wedge, which gives extra strength to the saw. And Simonds' own special high-speed steel gives greater speed, feed, and depth of cut. So for uninterrupted operation, get Simonds I. T. Metal Saws from your Industrial Supply Distributor, or from the nearest Simonds office.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.
Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry
SIMONDS STEEL MILLS — Special Electric Furnace Steels
SIMONDS ABRASIVE CO. — Grinding Wheels and Grains
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BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory:* 595 St. Remi St., Montreal 30.

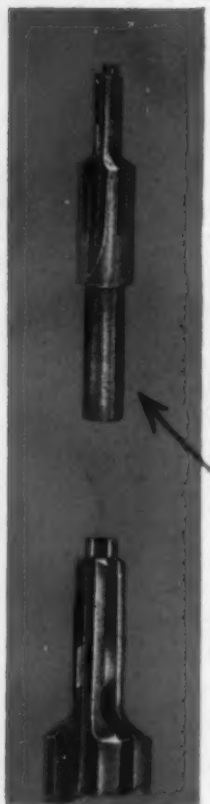
STAPLES JOB ENGINEERED CARBOLOY-TIPPED TOOLS
CEMENTED CARBIDES

SLASH COSTS

ON ACCURATE, HIGH PRODUCTION HOLE FINISHING OPERATIONS

In the manufacture of switchboards, considerable time was required to precision-ream the many jack holes, then form a blending radius in each hole. Staples designed this tool to combine both operations. The job is now completed in *less than half* the former time.

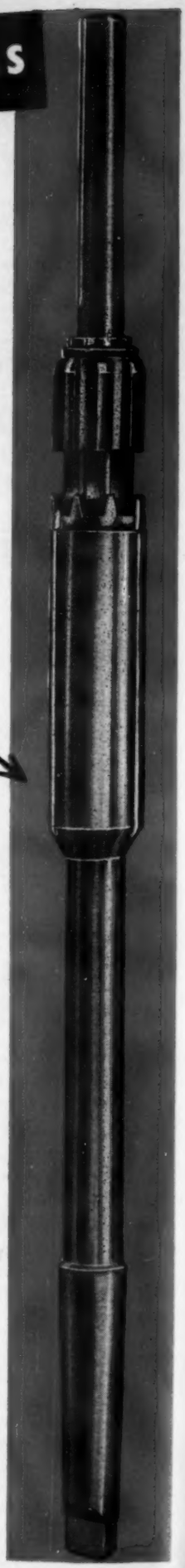
Tool costs are greatly reduced by the patented expansion principle engineered in this ¼" reamer. When the reamer wears to the tolerance limit, it is accurately expanded to original size. The tool can be expanded many times without regrinding.



Enlarged view of reamer section showing expansion principle.

Example 1 Staples Carboloy - Tipped Combination Expansion Reamer and Radius Forming Tool...
Reamer diameter ¼"
Overall length 2⅝"

Example 2 Staples Carboloy - Tipped Piloted Shell Type Expansion Reamer...
Reamer diameter 1"
Overall length 16½"



Used to finish ream holes in motor blocks, this Staples Tool illustrates how a solid reamer can be converted into an expansion type (patented).

To compensate for wear, the reamer shell is expanded by driving it up the tapered arbor. Uniform parallel expansion the full flute length is maintained, permitting easy adjustment to .0001". The reamer is re-expanded until maximum utility is reached. A new tool is then obtained simply by replacing the worn shell.

Staples Standard *and* Special *job engineered* Tools make possible substantial savings in *tool costs*, *labor costs*, and *production time*. Are there opportunities for similar savings in *your* production? Call in a Staples Tool Engineer for an on-the-spot examination. There is no obligation.

THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio
Distributors in Major Cities

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

500 housings per hour

FOR GENERAL MILL'S IRONS ON ONE H-P-M PRESS!

That's high-speed production of Tru-Heat electric irons

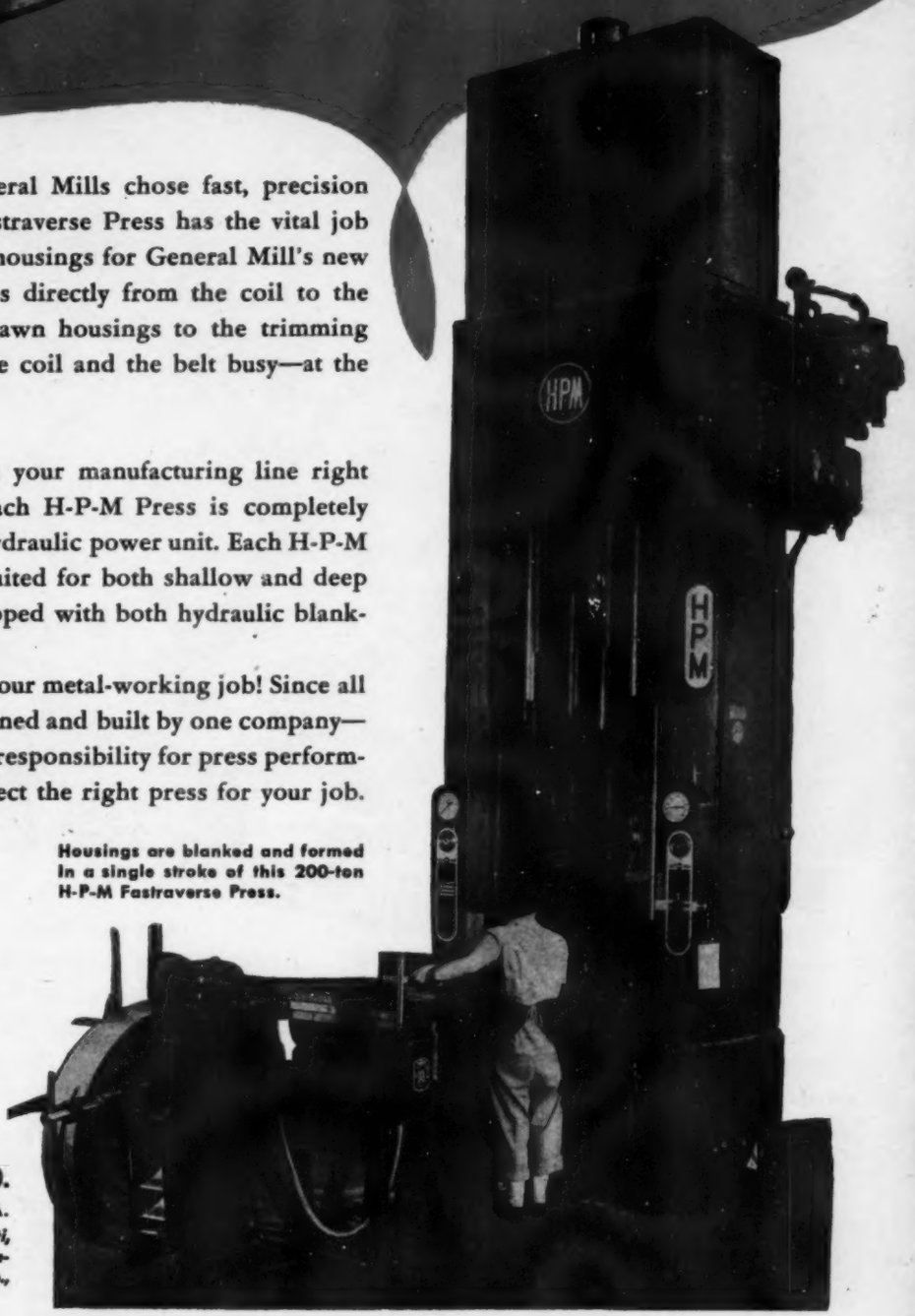
For fast precision manufacture, General Mills chose fast, precision equipment. That's why an H-P-M Fastraverse Press has the vital job of turning out Tru-Heat electric iron housings for General Mill's new streamlined product. Steel strip passes directly from the coil to the press; a belt conveyer carries the drawn housings to the trimming press. And the H-P-M Press keeps the coil and the belt busy—at the rate of 500 housings per hour!

To Speed *Your* Production—

You can spot an H-P-M Press in your manufacturing line right where its pressing operation fits. Each H-P-M Press is completely self-contained—each carries its own hydraulic power unit. Each H-P-M Press is of versatile design—ideally suited for both shallow and deep sheet metal draw work. Press is equipped with both hydraulic blank-holder and die cushion.

There's an H-P-M Press to handle your metal-working job! Since all hydraulic units in each press are designed and built by one company—H-P-M—you are assured of undivided responsibility for press performance. Our engineers will help you select the right press for your job.

Bulletin 4602 describes H-P-M Metal-working Presses. Write today for your free copy.



Housings are blanked and formed in a single stroke of this 200-ton H-P-M Fastraverse Press.

THE HYDRAULIC PRESS MANUFACTURING CO.

1002 Marion Road, Mount Gilead, Ohio, U. S. A.

Branch Offices in New York, Philadelphia, Cincinnati, Cleveland, Columbus, O., Detroit and Chicago. Representatives in other principal cities. Export Dept: 500 Fifth Ave., New York, N. Y. Cable—"Hydraulic".

HPM

All-Hydraulic Self-Contained **Metal Working Presses**

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

Gages with a PRE-OK

P&W PLUG AND RING CYLINDRICAL AND THREAD GAGES

Once it was standard practice for manufacturers to check *all* new gages to their own standards before putting them in use. Today, there's an exception to this rule — P&W GAGES.

The reason? Many of our customers found that they were wasting time checking P&W gages. They found all gages within tolerance. Confidence increased to the point that they now enter countless plants with a *PRE*-OKEH. They go from the shipping container directly to the job.

You wouldn't consider this a miracle if you were to see how P&W gages are engineered, manufactured and tested. They're the result of 80 years of development of designs, materials, heat treatments, finishes and tolerances that are cutting costs per unit gaged wherever they are used. P&W accuracy sees to that, right through the most rigid inspection system in use anywhere.

There are P&W gages for every purpose. And they're vital to low-cost production — essential of present day competition. Cut your costs with P&W *Pre*-Okehed gages. Call your P&W Engineer or write for details.

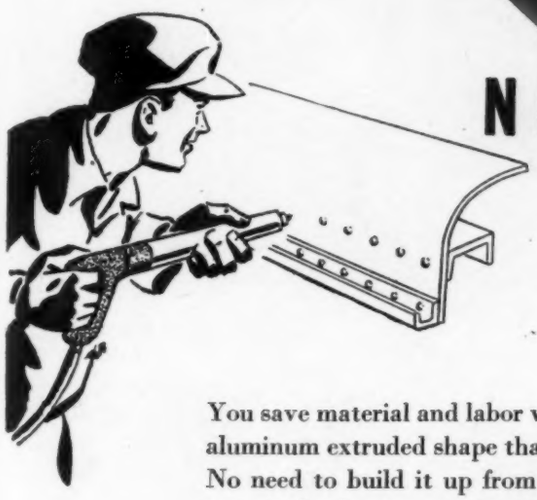
Pratt & Whitney

Division **Niles-Bement-Pond Company**

West Hartford 1, Connecticut

ALCOA ALUMINUM EXTRUDED SHAPES

NEED NO BUILD-UP



You save material and labor when you order an aluminum extruded shape that fits your design. No need to build it up from angles, channels, tees, and other conventional shapes.

The aluminum in an extruded shape is used at maximum efficiency . . . strength where strength is needed, economy of metal where loads are light. No lap joints and double thicknesses to rivet through, no extra rivets to add weight.

Die charges for extruded shapes of your own design are much less than you'd think.

Our engineers will be glad to help you adapt Alcoa Aluminum Extruded Shapes to the things you make. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in leading cities.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

A BUYING GUIDE FOR ABRASIVES

POINT No. 6

LOCAL DISTRIBUTOR SERVICE

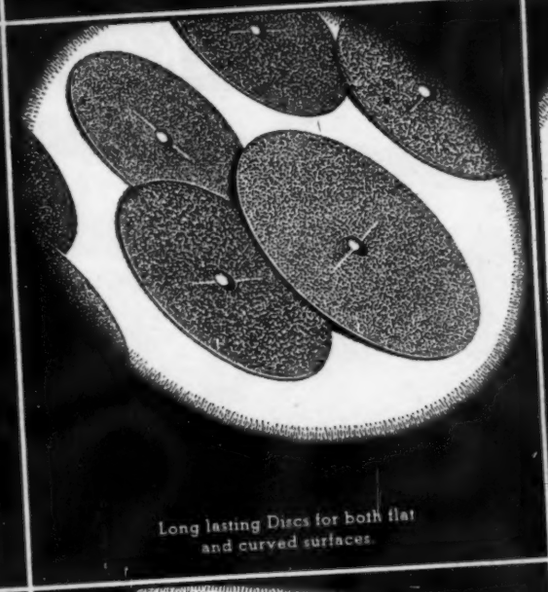
With progressive purchasing methods dictating improved efficiency of supply, the services of your CARBORUNDUM distributor assume increased importance. Prompt delivery of standard wheels, coated abrasives, sticks and stones, and grains by CARBORUNDUM is assured from large and varied stocks conveniently located nearby. Factory inventories of these items can be safely and economically reduced. More efficient use of abrasives is promoted through a local staff, trained by CARBORUNDUM, and familiar with varied applications. They are informed on latest developments and have access to CARBORUNDUM representatives when the problem is too difficult or unusual. Intelligent handling and efficient office routine is also pointed to by some customers who prefer the personal consideration and attention rendered by these modern distribution units. These services account in part for the increasing preference for products by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM

A Good Rule for Good Grinding

Tool Room sticks and stones that cut fast... last long...and hold their form.

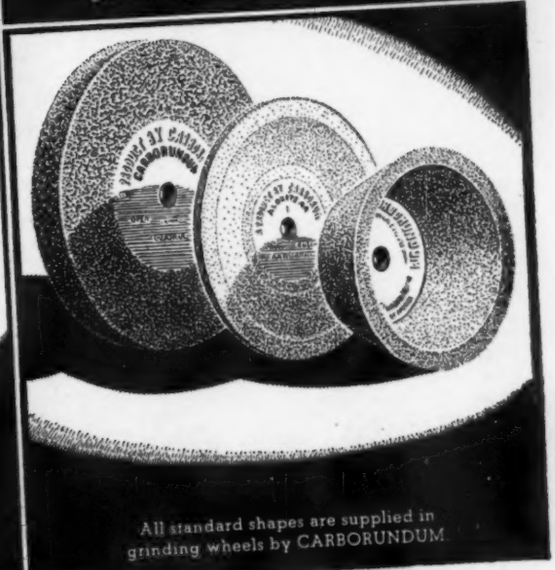
Cutting-Off Wheels... the modern tool for faster, less costly, more finished cuts.



Long lasting Discs for both flat and curved surfaces.

Mounted wheels, in all standard grits and grades, for portable grinding equipment.

A Coated Abrasive for every sanding and finishing condition.



All standard shapes are supplied in grinding wheels by CARBORUNDUM.

... CALL IN CARBORUNDUM TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

THIS IS DUPLITROL . . .

. . . FOR MAKING REPETITIVE PARTS *WITHOUT JIGS!*

2 ¾ x ¾ C.R.S. **BARS** *ONE* HORIZONTAL *ONE* VERTICAL . . . with ¼" holes machined at the desired spacing.

+ **2** HARDENED **PINS** . . . used to select locations according to the desired pattern of holes.

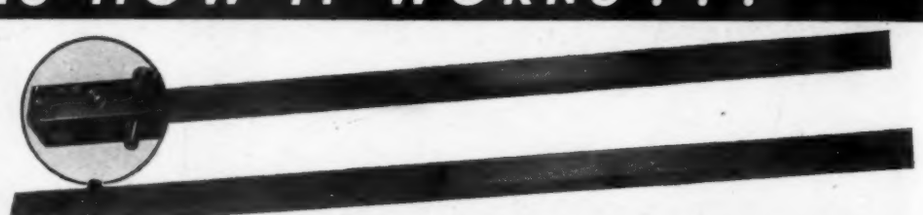
+ *Automatic* **POSITIONING** . . . accurately and dependably provides foolproof spacing for machining repetitive parts *without jigs.*

= DUPLITROL by DEVLIEG

The finest known process for accurately spacing and machining holes.

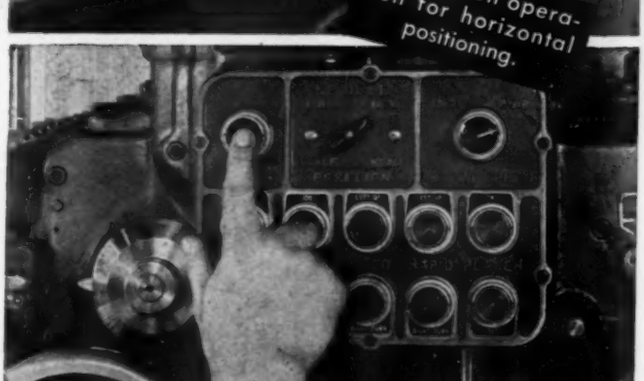
THIS IS HOW IT WORKS . . .

Illustrated at right is one vertical bar and one horizontal bar with pins used as masters on the 3B DeVlieg Duplitrol Equipped Jigmil. Below are illustrations showing how all spacing is done in response to push-button operation.



Push-button operation for vertical positioning.

Push-button operation for horizontal positioning.



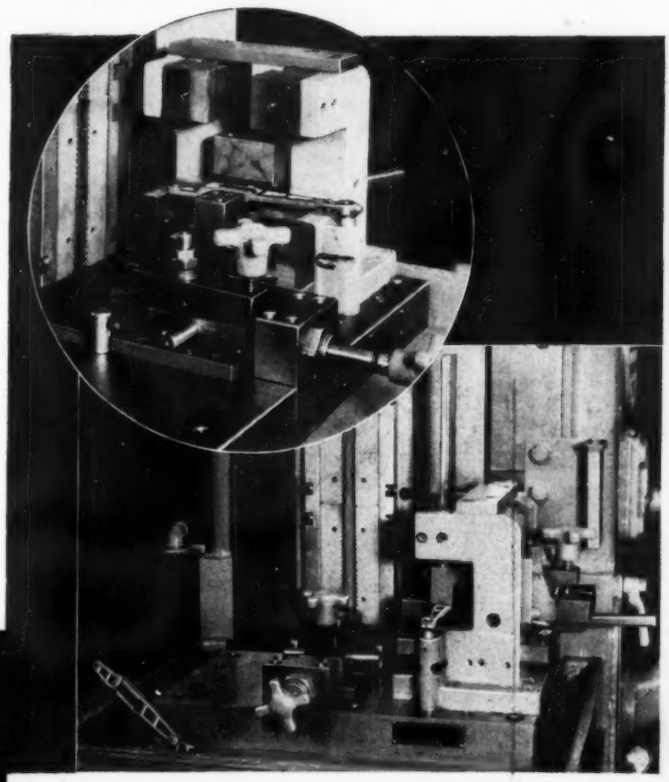
DeVLIEG MACHINE COMPANY — DEVLIEG JIGMIL — 450 FAIR AVE. FERNDALE 20, (Detroit) MICH.

American

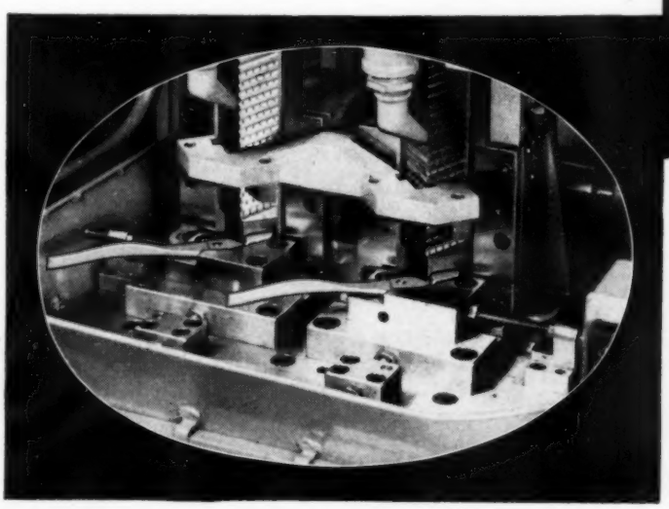
THE ONE SOURCE FOR *ALL* YOUR BROACHING NEEDS

One of the most important elements of any broaching job is the work holding fixture. To successfully obtain top production the fixture must be easily operated, solid in construction, and hold the work rigidly in position during the broaching stroke. *American* fixture engineers are skilled in the design of automatic and semi-automatic fixtures for high production, and manually operated fixtures when economy is a foremost factor.

For better broaching *American* builds the following complete line of broaching machines: Single Ram, Duplex Ram, Universal Type 3-way, Vertical Internal Pull-up, Horizontal, and Rotary. All sizes and types of broaches are also available, as well as Pull and Push Heads from *American*, as your one source of broaching needs.



(Above)—A simplified manually operated two station fixture to produce two sewing machine parts to close limits. A cast iron Slide Block is straddle broached at the left hand station; a slot in a malleable iron Main Connection part is surface broached at the right hand station. Parts are clamped manually, and floating jacks, also manually-operated, are provided to prevent springing of the Main Connection part. Exceptionally fine finish is obtained on both parts which interlock in the final sewing machine mechanism.



(Above)—This *American* designed fixture for broaching the jaw teeth of plier halves consists of two work stations. Separate work locators are supplied for each type of plier half. Parts are automatically clamped and unclamped by means of an air cylinder. Location is taken from the previously drilled hole in the forged steel part. Production of plier halves is increased considerably over the previous machining method.

PULL and PUSH HEADS CIRCULAR

Complete specifications for pull and push heads are contained in an attractive 8-page circular. Complete assortment of types and styles for every broaching tool. Write for "Broach Pull and Push Head Circular." No obligation.

MEMBER BROACHING TOOL INSTITUTE

American BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

32 ALUNDUM*...

The greatest abrasive contribution to increased grinding production in over 40 years!

WE expected 32 ALUNDUM abrasive to make a real hit but it has been ***even more successful than we anticipated.*** From plants everywhere are coming outstanding reports — some of them truly sensational — on the ability of 32 ALUNDUM wheels to lower grinding costs by . . .

1. **cutting faster**
2. **cutting cooler**
3. **requiring fewer dressings**
4. **lasting longer**

If you are not already using 32 ALUNDUM grinding wheels, it will pay you to get in touch with your Norton abrasive engineer or Norton distributor at once.

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities

NORTON ABRASIVES

..and Here is PROOF

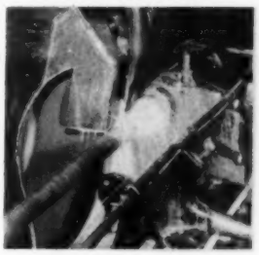
Production Time Cut 25% — Wheel Life Increased

GEAR GRINDING

A prominent Ohio machine tool builder changed to 32 ALUNDUM wheels (32A54-J5VBE, 20 x 1¼ x 8", dish shape) on his Pratt & Whitney Gear Grinders. Production time was cut 25% and wheel life lengthened 25%. The "32" wheels give a better finish and better tooth shape.

Production Increased 15% — Wheel Life 33⅓%

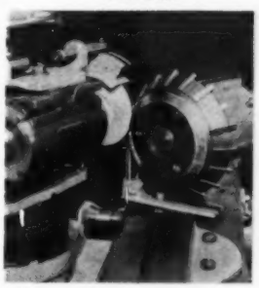
CYLINDRICAL



Changing to a 32 ALUNDUM wheel (32A362-N5VBE) for this plunge-cut grinding of automobile axle shafts (3145 and 4340 steel — stock removal .015"-.025") reduced production time to 18 seconds per shaft with 50 shafts ground per dressing compared to 18 for the competitive wheel previously used. Wheel life is one third longer, diamond cost is greatly reduced, finish is improved.

Six Times Around Without Dressing

TOOL



When grinding this 10" milling cutter (18 inserted teeth each ⅜ x 1⅝") with the best previous tool wheel, taking off .002" per pass, a few teeth burned on the second revolution and all teeth on the third. When the operator changed to a 32 ALUNDUM wheel of the same grain and grade (32A46-K5VBE) he found that he could remove .002" from each tooth for *six revolutions* of the cutter without a sign of tooth burn or wheel loading.

Production Doubled — Finish Improved

SURFACE

Surfacing a cast iron core plate (35% steel scrap) containing many holes and grooves necessitated a hard wheel with a consequent rapid dulling action — dressings were necessary every .010" of stock removal — maximum feed per pass was .001". Changing to a 32 ALUNDUM wheel (32A36-G12VBEP) jumped feed per pass to .002" with a stock removal of .020" to .030" per dressing. Production time dropped from 35-40 minutes per plate to 20 minutes and finish was greatly improved.

New Production Job Licked by "32"

INTERNAL

A bearing manufacturer started a new production job — the grinding of railroad bearing sleeves of hard SAE 52100 steel, 9" bore, 8" width, stock removal .070" to .080". Several makes of wheels were tried without success — 8 or 9 dressings being necessary per bearing. Then a 32 ALUNDUM wheel (32A801-G12VBEP) licked the job. While it can do an entire bearing without dressing the usual procedure is to dress once during roughing and again before the finish pass of .002".

THERE ARE HUNDREDS OF REPORTS LIKE THESE FIVE IN THE NORTON ENGINEERING FILES

Other NORTON Grinding Wheels for Increased Production

DIAMOND WHEELS

Diamond wheels offer the fastest way to grind the carbides, glass, ceramics, stone and other super-hard products. The three types of Norton Diamond Wheels — Vitrified, Resinoid and Metal Bonded — make it possible to meet the exact requirements of each job.

FOUNDRY WHEELS

The two new Norton resinoid wheels — B-5 and B-7 — are breaking production records in many foundries. They cut fast and smooth without sacrificing wheel life.

DISC WHEELS

Norton has disc wheels in the necessary variety of abrasives and bonds to increase production on all kinds of disc grinders. An outstanding combination for many jobs is 57 ALUNDUM abrasive and B-5 resinoid bond.

CUT-OFF WHEELS

There's a complete line of Norton Cut-off Wheels for the quick, economical cutting of metallic and non-metallic rods, bars, tubes and other shapes — in resinoid, rubber and shellac bonds.

MOUNTED POINTS

To increase production in tool and die shops as well as speed up many production jobs there are Norton Mounted Points and Mounted Wheels in over 100 standard sizes and shapes.

NEW!

NORBIDE* Dressing Sticks

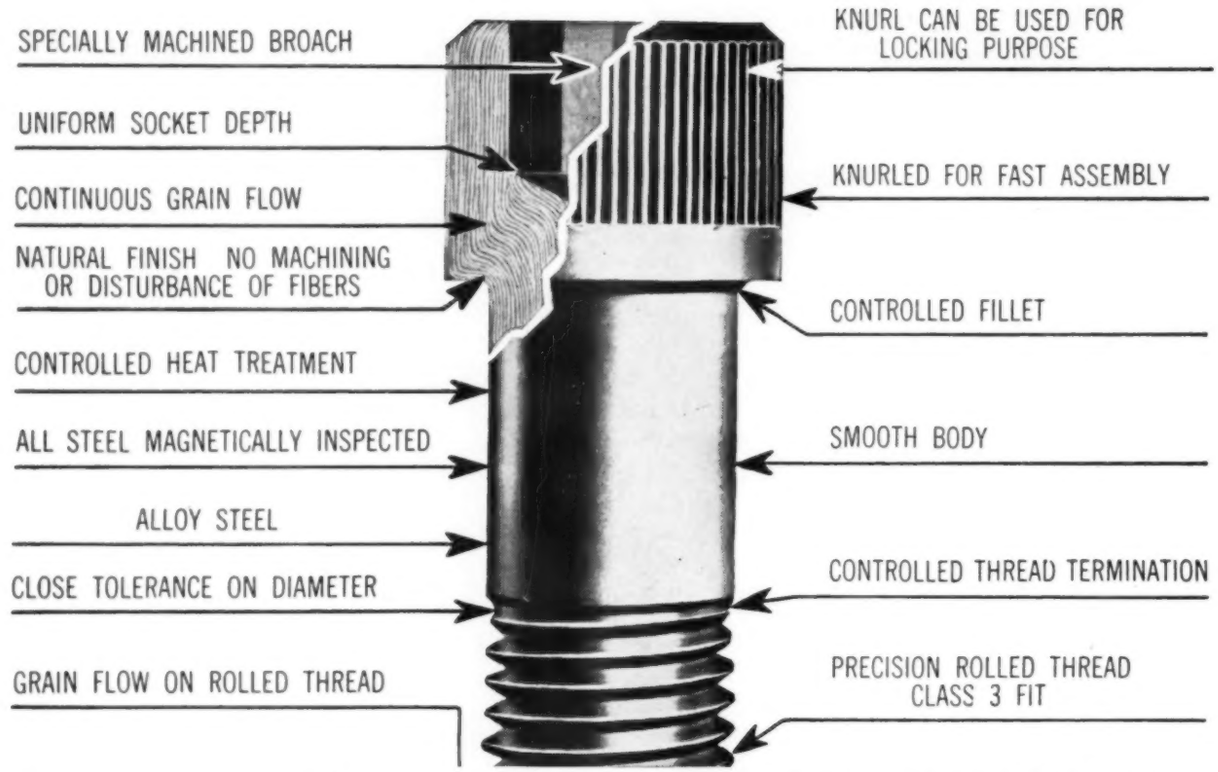
For wheels 10" and smaller, they are saving time and money in many tool rooms. Small, light and easy to use, they will outwear abrasive dressing sticks 100 to 1. NORBIDE Dressing Sticks are made of Norton Boron Carbide — the hardest material made by man for commercial use.

*Trade-mark Reg. U.S. Pat. Off.

These IMPORTANT FEATURES *of*

UNBRAKO KNURLED SOCKET HEAD CAP SCREWS

REG. U. S. PAT. OFF.

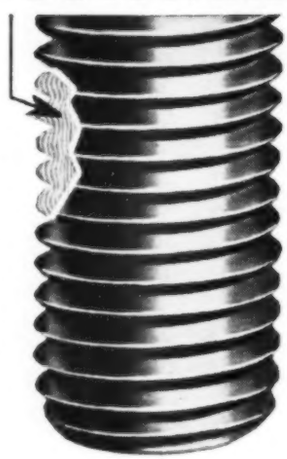


Give you these OUTSTANDING ADVANTAGES

STRENGTH, TOUGHNESS, RELIABILITY . . . the result of constant testing, inspection and quality control.

KNURLED HEAD FOR EASY ASSEMBLY . . . the knurled head provides a slip- and fumble-proof grip, even for the most oily fingers, therefore, the screw can be screwed-in faster and farther before it becomes necessary to use a wrench.

We also make the famous "Unbrako" Socket Set Screw with the "Self-Locking" Knurled Cup Point, and the "Unbrako" Socket Set Screw with the "Self-Locking" Knurled Threads.



OVER 44 YEARS IN BUSINESS

EASY START THREAD POINT . . . specially designed to assure fast, easy thread start.

INTERNAL WRENCHING . . . to promote Compact Designs which save space, material, weight and costs. Write for your copy of the "Unbrako" Catalog.

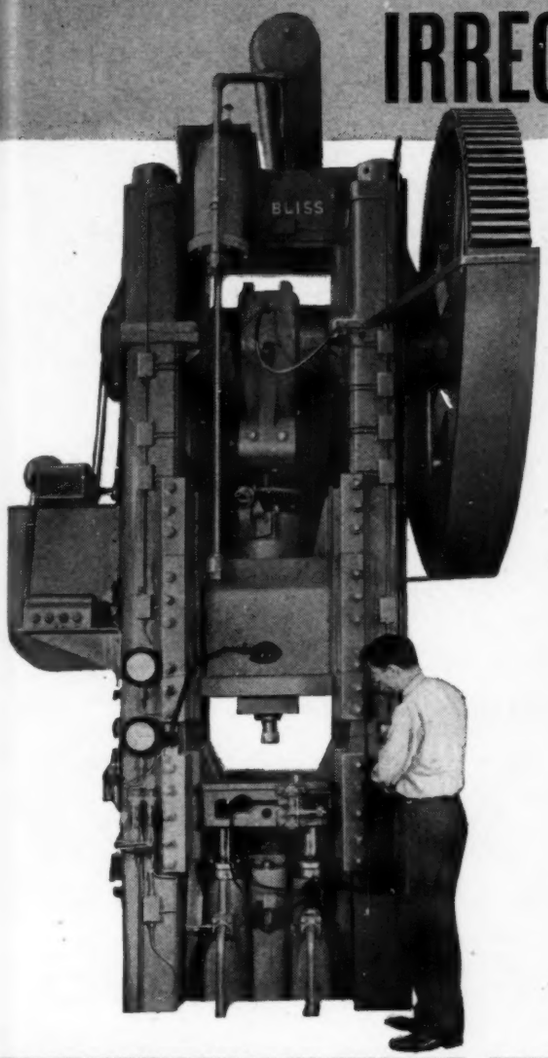
"Unbrako" and "Hallowell" Products are sold entirely through distributors.

Knurling of Socket Screws originated with "Unbrako" in 1934.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX [4] • BRANCHES BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

NEW BLISS BRIQUETTING PRESS EXTENDS METAL POWDER APPLICATION TO LARGE, IRREGULAR CROSS-SECTIONS



Complex powder metal parts beyond the size range and capacity of available single-action mechanical or hydraulic presses can now be produced to close tolerances in this new Bliss No. 309 Briquetting Press. Developed in cooperation with a large powdered metal parts fabricator, the press employs a unique operating principle which combines the advantages of triple hydraulic lower motion—floating die table, core rod and stripper—built into a 345-ton mechanical press.

Uniform density throughout the finished part is assured by the hydraulically controlled floating die table and core rod rams which recede against pre-determined pressure by simple, independent adjustments. This has the effect of squeezing the powder from the top and bottom. Many combinations of the three lower motions are made possible by flexible electric timing devices. Table and core rod can be kept stationary if desired. A variable speed motor and two-speed gearing provide 6 to 18 strokes per minute.

Once set up, the press is easy to operate. A hopper feed arrangement automatically fills the die and ejects the previously finished piece.

Tell the nearest Bliss sales representative about your metal powder equipment needs. Recommendations will be made without obligation.

E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

Mechanical and Hydraulic Presses, Rolling Mills, Can and Container Machinery

WORKS AT: Brooklyn, N. Y.; Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Derby, England; St. Ouen sur Seine, France • SALES OFFICES: Detroit; Brooklyn; Cleveland, Dayton, Toledo, Ohio; Lansing, Mich.; Chicago; Philadelphia, Pittsburgh, Pa.; Rochester; New Haven; Boston; Toronto.

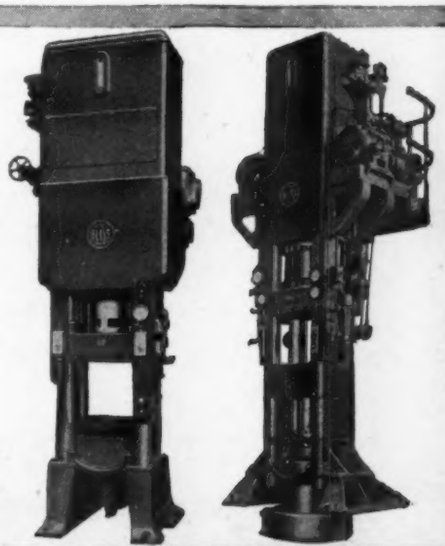
SPECIFICATIONS

	CAPACITY	STROKE*
Slide	345-ton	10"
Core Rod	60-ton*	3¼"
Stripper (eject up)	75-ton*	6"
Die Table	120-ton*	3"

*adjustable

Bliss also builds other special multi-action hydraulic presses for metal powder products. Shown here are two 200-ton presses: one a single action machine, equipped with hydraulic ejector, and the other a duplex press which provides simultaneous squeezing by two slides with independently controlled speeds and adjustable pressures. Lower slide also acts as an ejector.

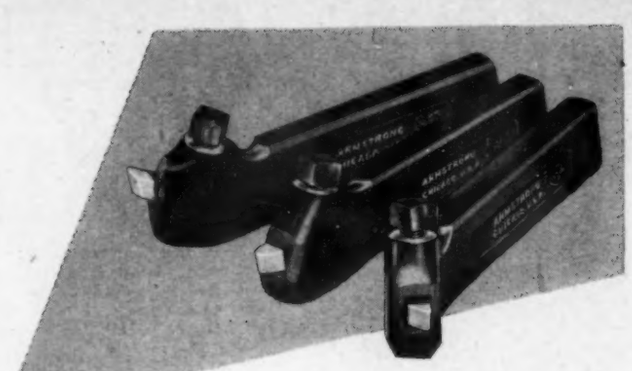
SEND FOR COPY OF *"PRESSES FOR POWDERED METAL PRODUCTS"*



BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY

STAY AHEAD WITH *Bliss*

ARMSTRONG TOOL HOLDERS answer both. . .



1. The problem of lowering costs
2. The problem of increasing output

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

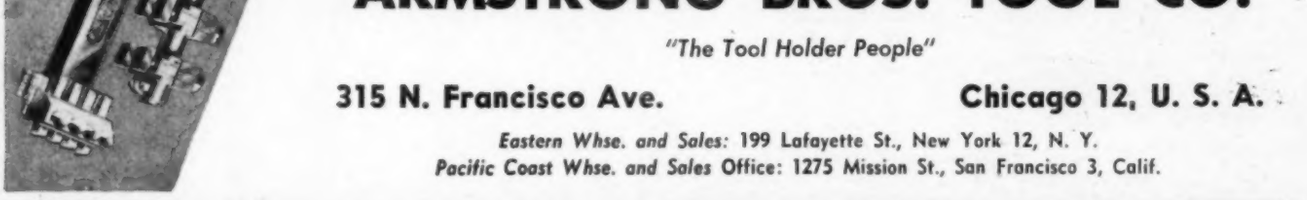
There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

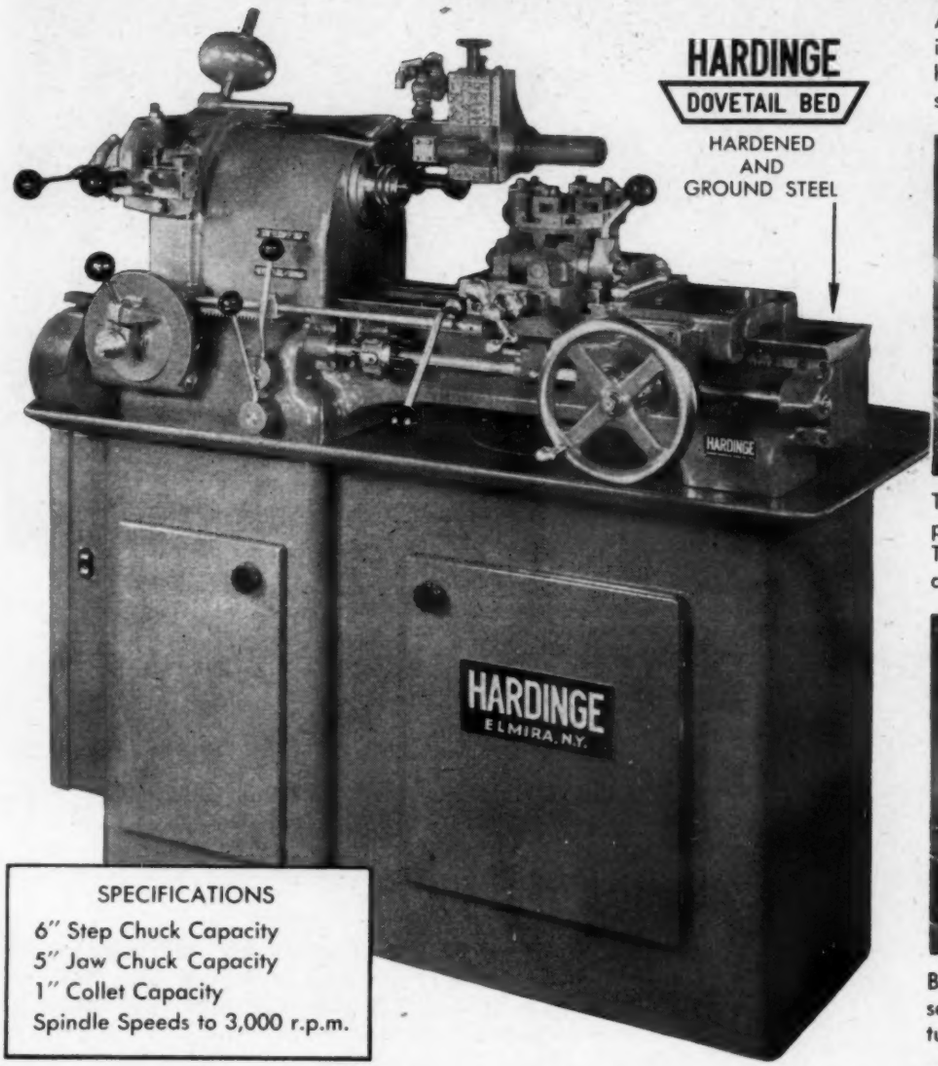
315 N. Francisco Ave. **Chicago 12, U. S. A.**

Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. and Sales Office: 1275 Mission St., San Francisco 3, Calif.



HARDINGE
ELMIRA, N.Y.

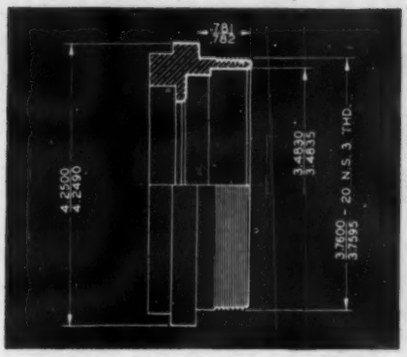
PRECISION *Multi-Operation* CHUCKING MACHINE



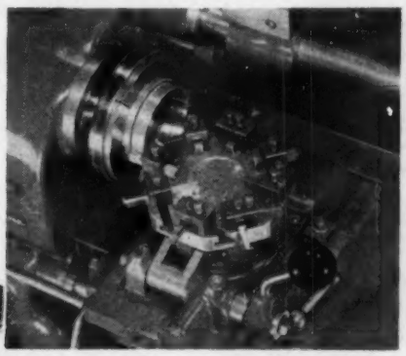
SPECIFICATIONS
6" Step Chuck Capacity
5" Jaw Chuck Capacity
1" Collet Capacity
Spindle Speeds to 3,000 r.p.m.

Here is an example of precision production work easily handled by the new Hardinge Multi-Operation Chucking Machine — in one chucking, twelve surfaces were finished with single point tools to specified tolerances in addition to the threading operation. The tooling was entirely standard, using standard tool bits, step chuck and lead screw. Three of the precision machining operations are illustrated at the right together with the blueprint of the part.

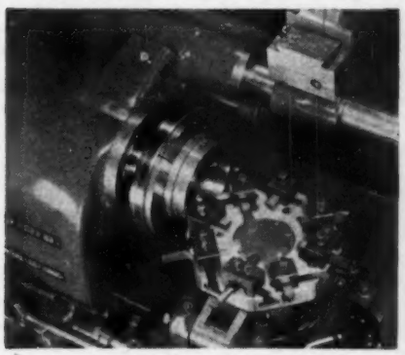
Send for FREE illustrated bulletin.



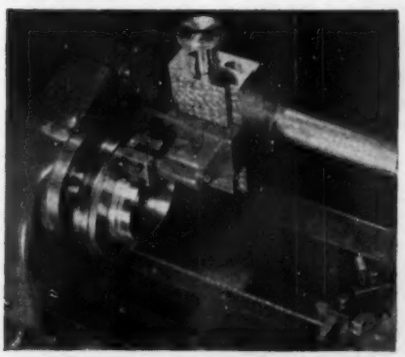
A typical part from rough blank, finished on twelve surfaces (indicated by heavy white lines) and threaded to specified tolerances.



Turning — close-up view showing the part held in a standard step chuck. Threading head withdrawn to give ample space for free turret operation.



Boring — note the simple standard square tool bits; and closeness of turret to work.



Threading — high speed threading with extreme accuracy because there are no intervening gears.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

because they can be depended on for ECONOMY, EFFICIENCY *and* SPEED

All the essential performance qualities demanded in small tools today are met in UNION TOOLS.

Faster cutting, longer life between grinds, accuracy and all-round better performance of these tools are matters of common recognition in plants busy on work where small tools are subjected to the most exacting service conditions.

You, too, can depend on UNION TOOLS for your requirements. Try them once and you'll use them regularly.

THE UNION LINE

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

●

UNION TWIST DRILL COMPANY, ATHOL, MASS.

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MANUFACTURING DIVISIONS

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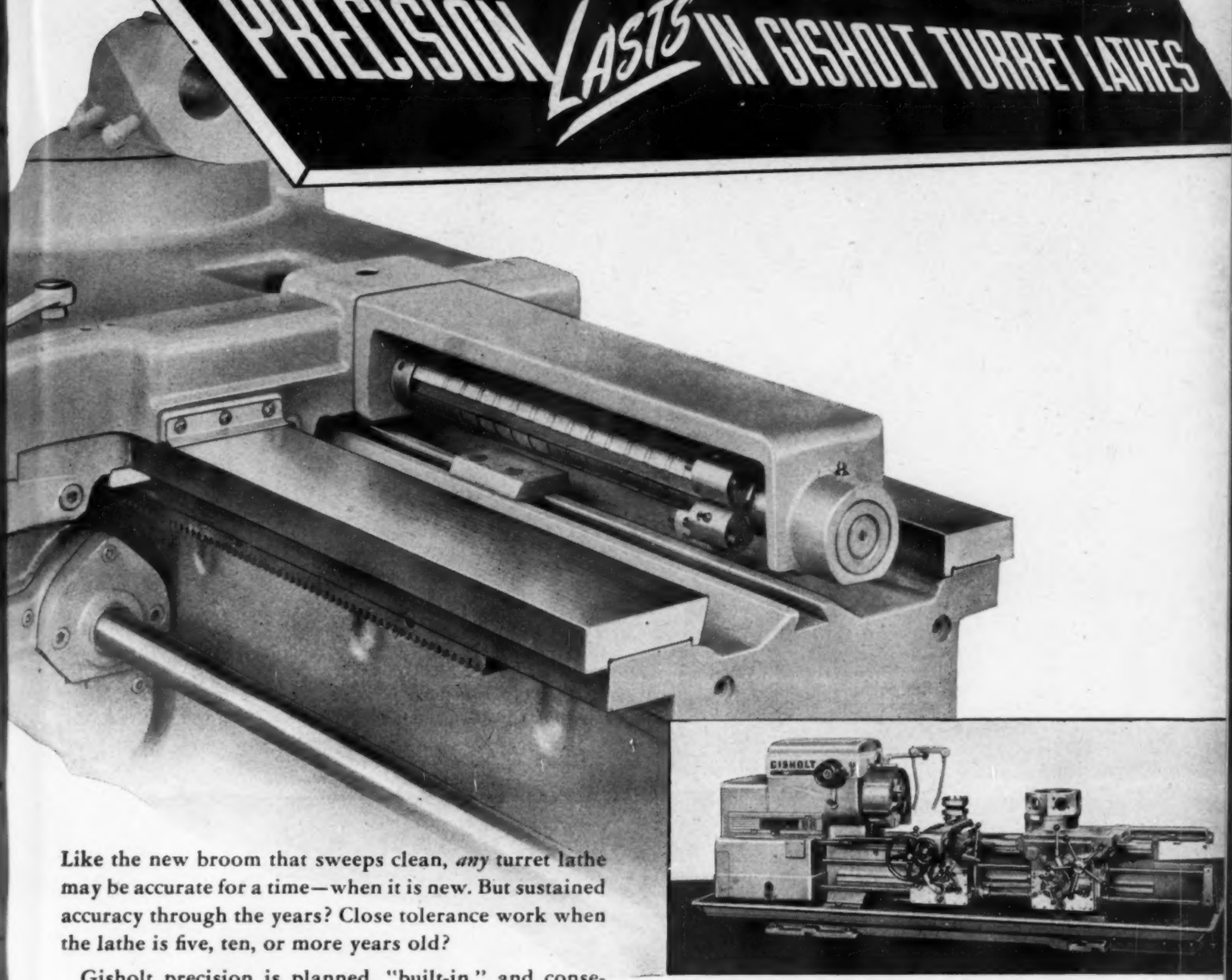
UNION

PRECISION *LASTS* IN GISHOLT TURRET LATHES



Like the new broom that sweeps clean, *any* turret lathe may be accurate for a time—when it is new. But sustained accuracy through the years? Close tolerance work when the lathe is five, ten, or more years old?

Gisholt precision is planned, "built-in," and consequently far more permanent than that of many other lathes which are merely *fast starters.*

For example: Gisholt's bed ways are of hardened tool steel (64-66 Rockwell C) — virtually wearproof. Accuracy is *dependable* because the ways are keyed and firmly bolted to the bed and then finish ground in exact alignment with the spindle.

Further, the headstock and bed, cast in one piece, are heavy and rigid—not subject to distortion. The forged steel spindle, mounted in precision tapered roller bearings at both ends, carries heavy work at maximum speeds and feeds without deflection or chatter—year after year.

These, and many other provisions for *permanent* accuracy, are the assurance of lasting precision in the performance of Gisholt turret lathes. If you have one, YOU KNOW!

GISHOLT 2L HIGH PRODUCTION SADDLE TYPE TURRET LATHE *built to withstand the heaviest feeds and the highest cutting speeds possible with any tool. The 2L typifies Gisholt's half-century experience in building the finest class of metal working equipment. Write for full details.*

GISHOLT MACHINE COMPANY

Madison 3, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and semi-round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

DRILLING • REAMING • TAPPING IN ONE SET-UP ON THE

Fosdick Jig Borer

● The Fosdick Jig Borer illustrated is meeting close tolerance drilling — reaming — tapping operations, in one set-up, in the plant of a nationally known manufacturing company.

The heavy duty column—sturdy spindle support —substantial knee structure provides necessary rigidity to produce consistently accurate work. For extreme precision work, measuring rods and dial indicators may be furnished with the machine for an additional charge.

All controls and operating handles are at the front of the machine—substantially reducing the operator's handling time. This is an exclusive Fosdick Jig Borer Feature.

For precision work requiring boring, drilling, facing, tapping, etc., investigate the many advantages of the Fosdick Jig Borer.

Built in two sizes the No. 30—table 18" x 36" and No. 42—table 22" x 44". Fosdick Jig Borer Bulletin J.B.A. fully describes both of them.

Write for yours today.

THE Fosdick MACHINE TOOL COMPANY
CINCINNATI 23, OHIO

TWO SEPARATE OPERATIONS in the time required for rough milling—alone

NEWTON MILL-N-SHAVER

Combination Unit Head Milling and Shaving Machine equipped with two single vertical milling heads and two finish shaving heads. Hydraulic feed to table.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

The Newton Mill-N-Shaver performs two complete operations at one pass of the table. It rough mills at milling speed and finish shaves on the return, at the rapid traverse speed. This machine produces a perfect gasket surface. Two separate operations in exactly the time ordinarily required for rough milling alone. The Newton Mill-N-Shaver is designed to both step-up your production and reduce your costs on the types of work for which this machine is adapted. For detailed information, write for Bulletin No. 580.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

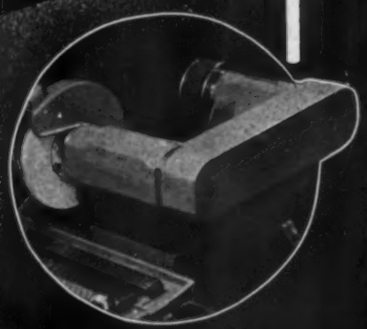
BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION

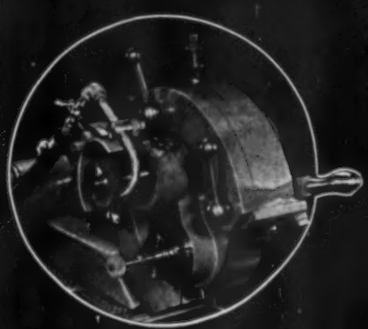
ROCHESTER 10, NEW YORK

Designed for EFFICIENCY

TO PRODUCE MORE OF A GREATER VARIETY THRU EASE OF PRECISION SET UP AND OPERATION



External Bracket



Internal, External Turret

The Rivett No. 104 is a simple, power-driven grinder suitable for tool making and precision manufacturing. Operations of widely varying nature can be quickly set-up and efficiently ground on one or many pieces. Interchangeable brackets are selectively mounted on the cross slide for internal, external, or concentric grinding in straight, taper, face or shoulder form.

RANGE

Internal spindles of suitable design and speed may be selected for hole grinding up to approximately 3" diameter and 4" length.

External bracket with 7" x ½" wheel may be used for on-center or chucked work up to approximately 3" diameter.

Turret for concentric grinding of hole or outside surface is limited to such work as may be chucked.

ARMY E NAVY

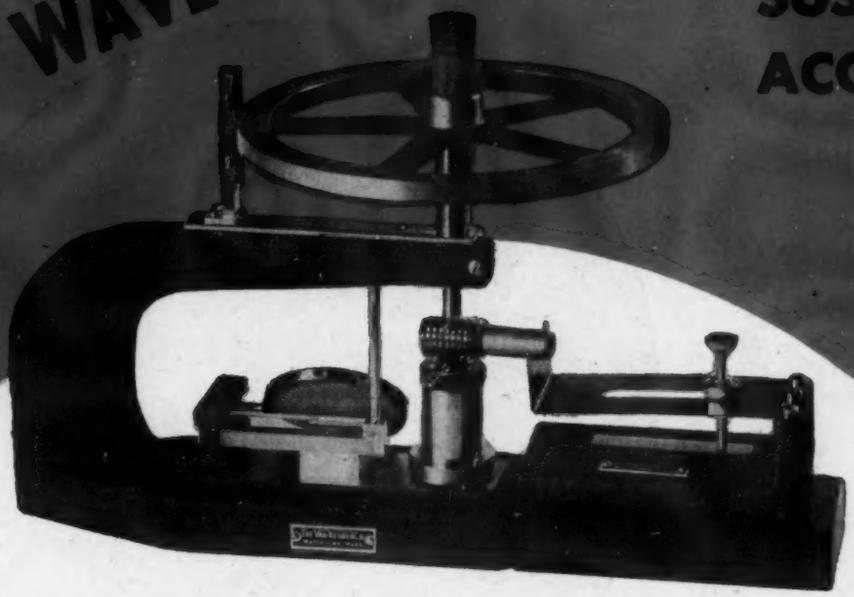
RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS. · U. S. A.

Write for Bulletin 104.

Van Keuren LIGHT WAVE MICROMETER for SUSTAINED ACCURACY



NEW SYSTEM OF ACCURACY—The Van Keuren light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

CONTROLLED PRESSURE ASSURES UNIFORMITY—By using the sensitivity of light waves the light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

IDEAL FOR SHOP MEASUREMENTS—The light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks—use the light wave micrometer. It is fast, accurate and profitable.

The Van Keuren light wave micrometer is described in catalog No. 33. This book also gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. *Write for your copy!*

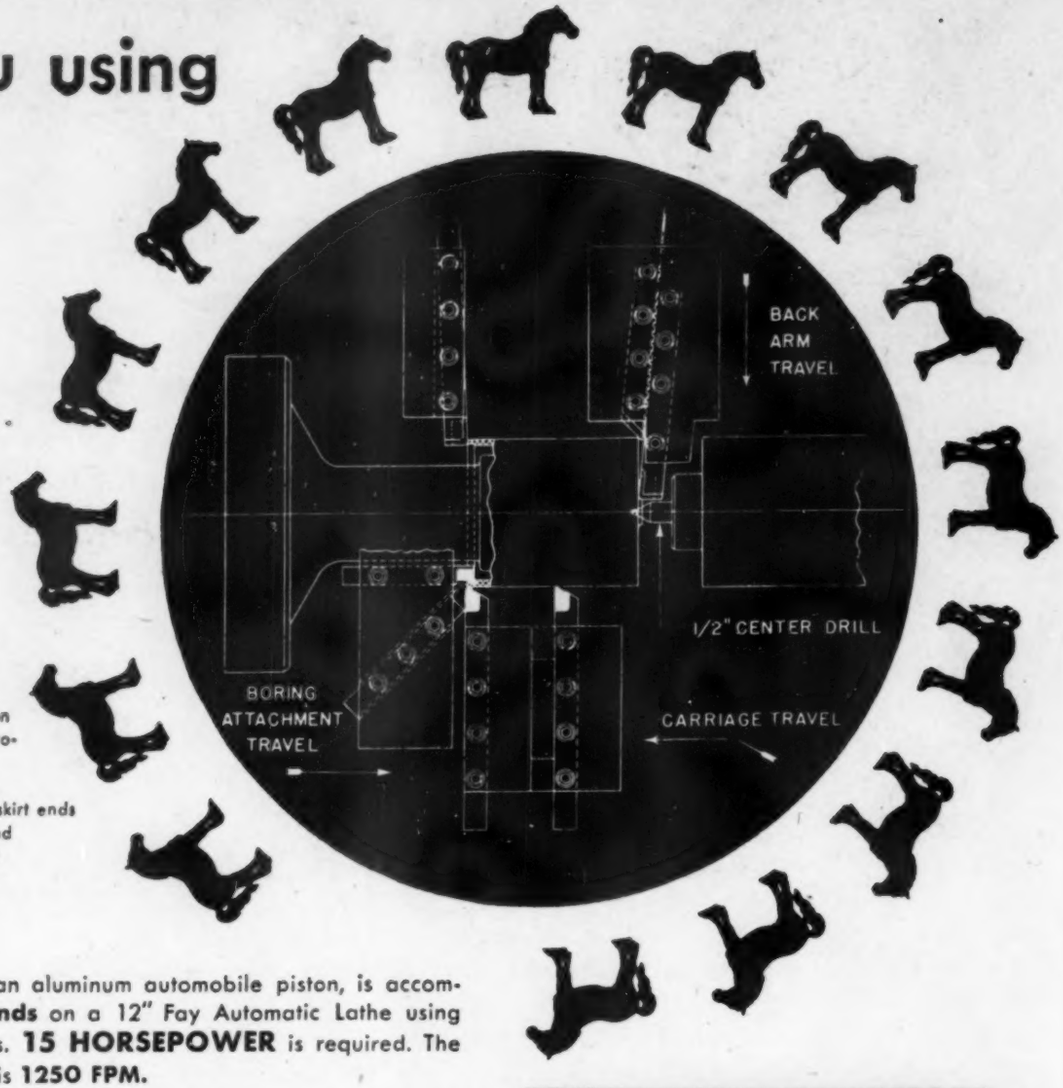
THE Van Keuren

28th YEAR

176 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.

How much **HORSEPOWER** are You using ?



1st. Operation on an Aluminum Automobile Piston:—
Rough turn O.D.
Face head and skirt ends
Center closed end
Rough bore skirt
Finish bore skirt
Chamfer skirt

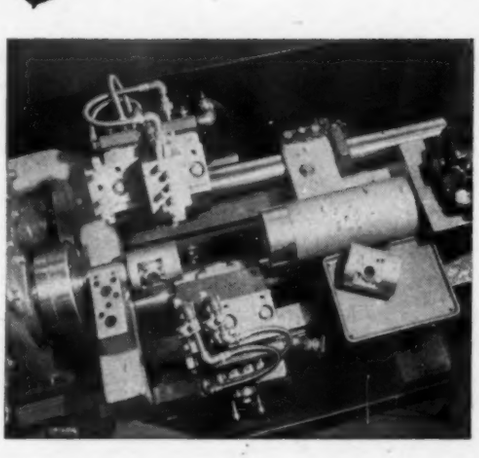
This operation, on an aluminum automobile piston, is accomplished **in 15 seconds** on a 12" Fay Automatic Lathe using carbide cutting tools. **15 HORSEPOWER** is required. The surface speed used is **1250 FPM.**

Carbide cutting tools have increased horsepower requirements as much as 300 per cent. They have increased cutting speeds 200 to 500 per cent.

Be skeptical of the production efficiency of your metal turning equipment. The chances are that turning accounts for 25 per cent or more of all machining time in your plant—that this is your major production expense.

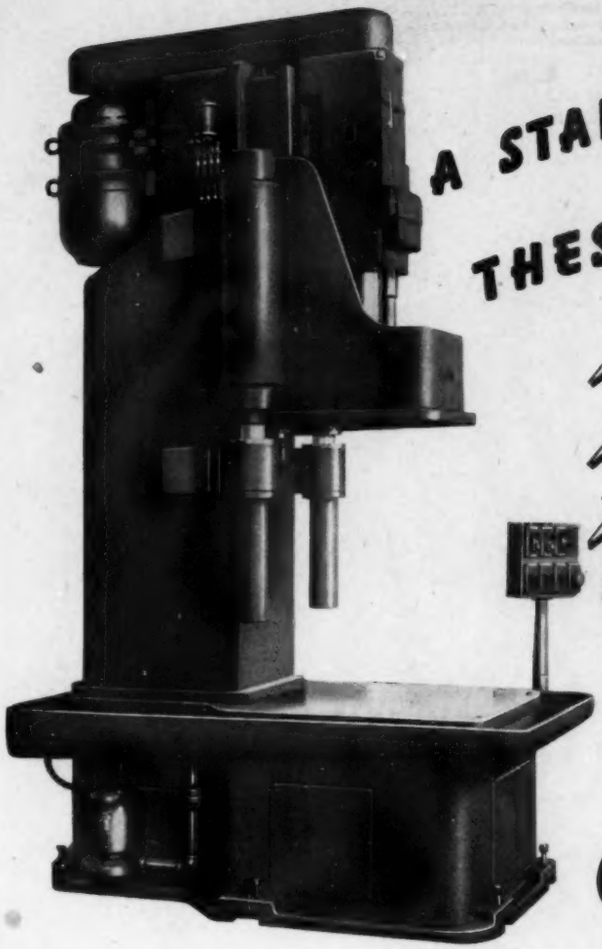
There are cases in our files of savings of hundreds of dollars a month in the manufacture of a single part by the efficient use of carbide cutting tools on Jones & Lamson machines. Our Turret Lathes and Fay Automatic Lathes are designed specifically for the most efficient use of these tools.

Send for our folder "Machining Automotive Pistons". Or better yet, telephone or write for a Jones & Lamson engineer who will be glad to consult with you on all phases of your metal turning problems.



JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Manufacturer of *Fay Automatic Lathes* and Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies



A STANDARD MACHINE WITH THESE 3 Advantages

- LOWER INITIAL COST
- REDUCED MAINTENANCE
- EASILY ADAPTED TO SPECIAL PURPOSE OPERATIONS

THE Robbins No. 3 Drillmatic

The Robbins No. 3 DRILLMATIC is designed and built as a STANDARD MACHINE specifically for special purpose drilling, reaming, tapping and boring operations *at lower cost.* Drill heads with any number of spindles are easily mounted on the tooling saddle and by use of auxiliary units around a special base, multiple operations may be performed vertically, horizontally or any angle in between. When operations are changed, the No. 3 Drillmatic can be economically converted to the new job.

Old-type soft ways are replaced by large diameter guide bars in the saddle. These bars slide in guide bushings on the oversize machine column. Both the bars and bushings are hardened and ground alloy steel . . . automatically lubricated. The saddle is actuated by a sturdy hydraulic ram directly over the work, reducing friction on the guide bars and further contributing to the life-time wearing qualities of both the bars and bushings.

The hydraulic power is contained in a compact unit which is stationary at the top of the machine column . . . no outside piping or valves and all connections are manifolded inside the unit . . . no leaks. Two separate adjustable feed rates are supplied and a wide variety of speeds is obtainable by using change gears within the unit or by changing V-belt pulleys.

Send for illustrated catalog which details the many "plus" features of construction and operation. Study them over; then consult with Robbins engineers on the applications in your plant. Robbins is qualified to design and build the tooling for your entire job . . . tooling that will do the job faster, better, more economically. ***Robbins Engineering Company, 318 Midland Avenue, Detroit 3, Michigan.***

R E Robbins
ENGINEERING COMPANY

Producers of ROBBINS MAGNA-SINE • ROBBINS UNIV-ANGLE
ROBBINS SINE PLATE • ROBBINS INDEX TABLES
ROBBINS No. 3 DRILLMATIC • SPECIAL MACHINERY

8" Diam. SAE 4620 steel forged rear axle drive gear blank.

1ST OPERATION—Taper face, counterbore and face bottom. Machine Time: 43 seconds.

2ND OPERATION—Face, form angle, rough and finish bore. Machine Time: 60 seconds.

CHUCK-MATIC PRODUCTION

Two Operations—1 Min. 43 Sec.—Complete

For accurate, high-speed production of chucking jobs take a tip from this typical case study—one of many we can show you on the new Acme-Gridley 12" Chuck-Matic. It's built *rugged*—and *powerful*—to deliver speeds and feeds as fast as carbide-tipped tools can take it. It's built for *high production*—with a minimum of idle movement and plenty of accessibility for quick setups, easy loading, easy adjustment. It's built *compact*—for space saving. And because it's *easy to operate*, one operator (he needn't be highly skilled, either) can run as many as four machines.

That's why we think you'll be interested in the complete details on the Chuck-Matic. Ask for bulletin SC-46.

Acme-Gridley 12" Single Spindle Chuck-Matic tooled for first operation on rear axle drive gear.

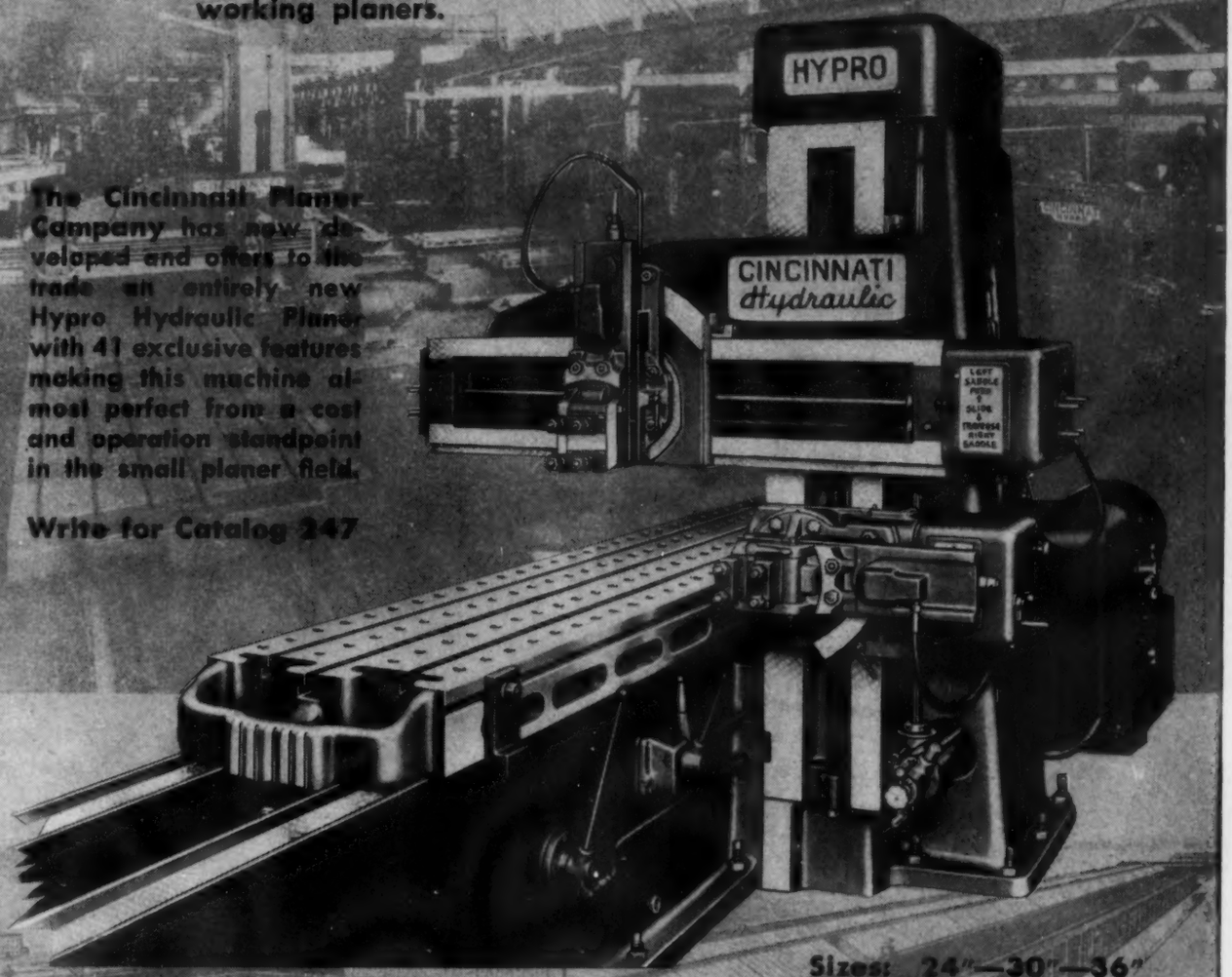
The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

SEE THIS EQUIPMENT DEMONSTRATED
Booth 628
Machine Tool Show
CHICAGO—SEPT. 17-26

A New Hypro Planer

Look at its Background... 50 years of continuous proven leadership in the design and manufacture of metal working planers.



The Cincinnati Planer Company has now developed and offers to the trade an entirely new Hypro Hydraulic Planer with 41 exclusive features making this machine almost perfect from a cost and operation standpoint in the small planer field.

Write for Catalog 247

Sizes: 24"—30"—36"
Double Housing or Openside

THE CINCINNATI HYPRO PLANER COMPANY
PLANERS · BORING MILLS · PLANER TYPE MILLERS
CINCINNATI, OHIO

GOVERNOR OF *Friction*

(*Herschel Coefficient of Friction*)

As power is the life blood of industry, friction is the deadly poison that can slow wheels, reduce efficiency to the point of disaster.

Correct lubrication, obviously, is the preventive which protects power against the depredations of friction. And . . . the coefficient of friction of a lubricating oil is an important factor in the utilization of input power in all machines.

Sinclair Research is ever alert to aid you in developing maximum output from your equipment with such apparatus as the Herschel Coefficient of Friction machine, shown above. This machine is invaluable where lubrication of all parts of machinery is concerned.

With such apparatus and the continuous effort of skilled experts in refinery control, Sinclair assures you of outstanding performance from lubricants developed specially for your specific application.

Sinclair Metal Working Oils

For General Alloy Steels:
WILKUT OILS

For Tough Alloys:
AUTOKUT OILS

For Water Emulsions:
SATISOL and TOOLTEX

For Honing:
HONOL OILS

SINCLAIR REFINING COMPANY • 630 FIFTH AVENUE, NEW YORK 20, N. Y.

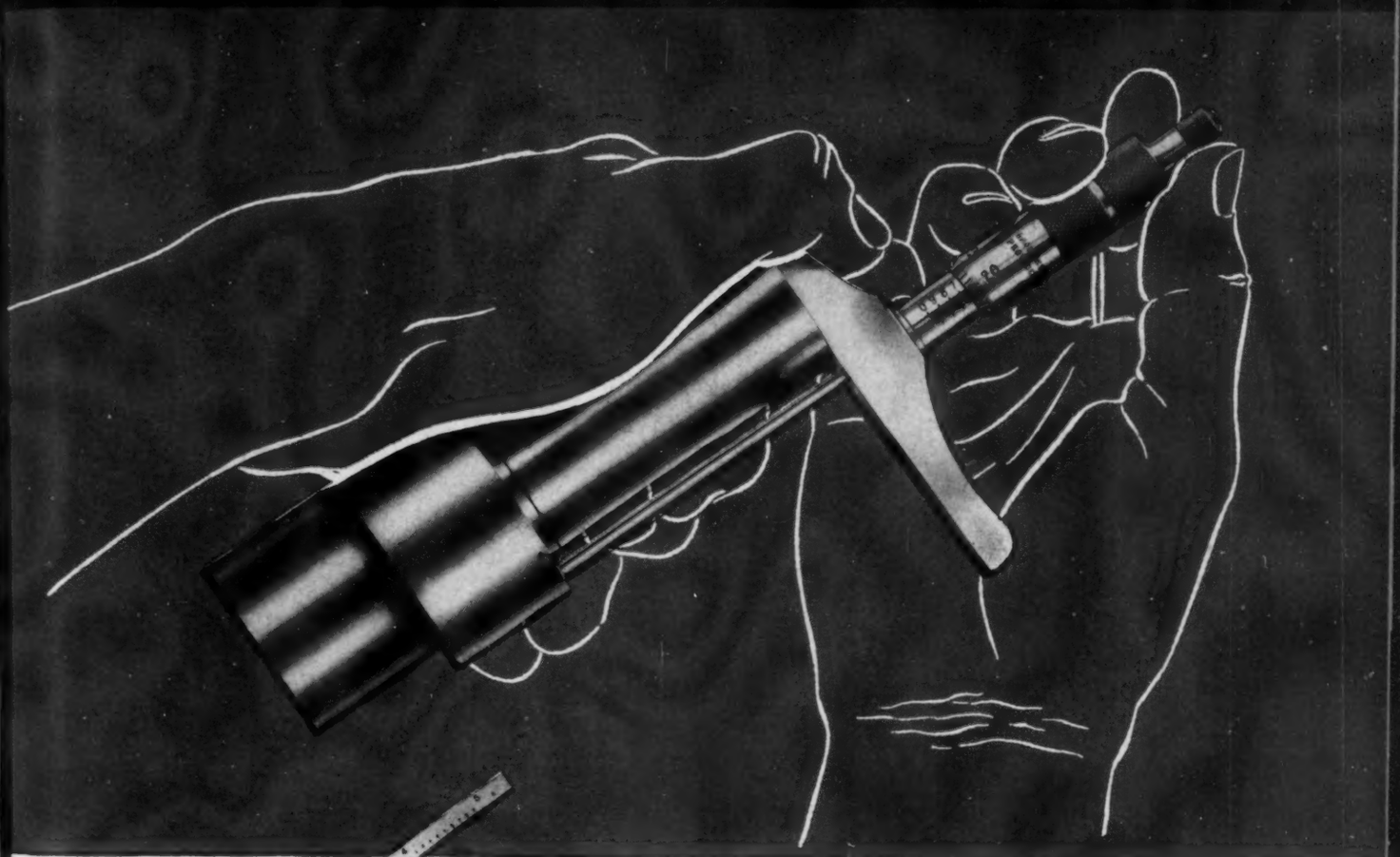
SINCLAIR

Lubricants for Industry

FINEST CRUDES + EXPERT RESEARCH and MANUFACTURING CONTROL = OUTSTANDING PERFORMANCE

ACCURATE MEASUREMENTS

—easier, faster



Depth Gages are an important group in the complete Brown & Sharpe line. Shown in use is Micrometer Depth Gage No. 607RS. Upper, Vernier Depth Gage No. 600. Center, Micrometer Depth Gage No. 605. Lower, Rule Depth Gage No. 615.

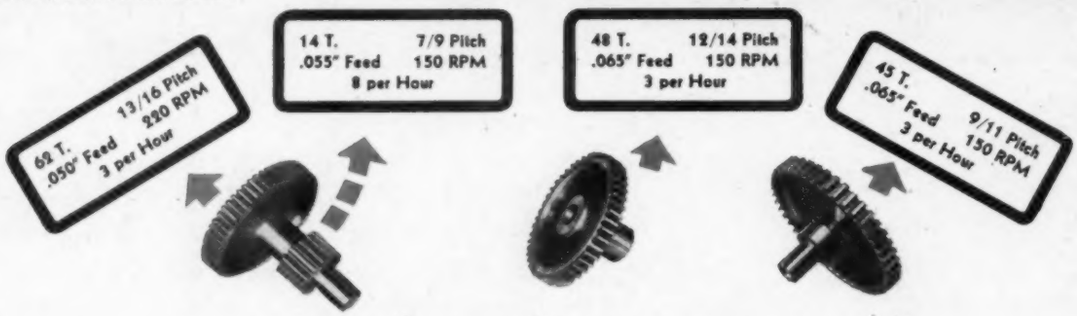
FROM THE DEVELOPMENT of the first Vernier Caliper, the design of Brown & Sharpe Tools has contributed to the attainment of a high standard of accuracy and the ease with which measurements could be made. Clean-cut lines, clear figures, easy adjustment and provision for quick, positive reading of measurements have made Brown & Sharpe Tools an important influence in the training of the apprentice . . . a large factor in the proficiency of the skilled machinist . . . contributing substantially to the success of modern manufacture. Brown & Sharpe Tools are a wise investment . . . for the future as well as for the immediate moment. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

MULTIPLE SAVINGS FROM Single Spindle Hobbing

4 — B-C Vertical Hobbing Machines Grouped As A Single Production Unit Yield More Pieces Per Hour, Reduce Handling Time, and Require 50% Less Floor Space Than Conventional Equipment Formerly Used.

Resulting from demands for increased production, with not enough factory space and personnel to provide it, B-C Type V Hobbing Machines, arranged in group units, have solved this manufacturer's problem of getting higher output, using the same floor space and operating personnel needed previously for two conventional machines.



FLOOR PLAN GROUPING

Each machine occupies only 19.8 square feet of floor-space, arranged as shown in floor-plan sketch. Production results are indicated for each of four separate parts. Faster feeds and speeds, hydraulic operation, and automatic cycling enable a single operator to handle the four machines as a unit. Continuous high speed hobbing from each machine at the same time results in more pieces per hour, with uninterrupted production, less handling time, 50% less floor-space, and consequent lower unit costs. For continuous high production gear hobbing, this same group arrangement offers many practical possibilities on a variety of work. Write Barber-Colman Engineering Service for additional information on Type V Group Hobbing for your gear production problems. Estimates will be furnished promptly, without obligation, on receipt of part prints and production requirements.

ACCURACY-RIGIDITY-POWER BARBER B-C COLMAN FOR HI-PRODUCTION HOBBING

JOB FACTS

Part — 14 and 62 Tooth Cluster Gears.
Material — AMS 6294 Steel, 8-14 R.C.

	14 T.	*62 T.*
Feed —	.055" per rev	.050" per rev.
Speed —	150 RPM	220 RPM
Production —	8 per Hour	3 per Hour

Hob Life — Each hob produces 150 gears per sharpening.

Cluster gears are now completely processed in continuous production, eliminating transfer to second operation as formerly required.

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.

A TYPICAL EXAMPLE OF

INGERSOLL *Equipment*

FOUR HUNDRED AND FIFTY FLAT IRONS AN HOUR

MACHINED WITHIN .005" OF FLATNESS

1. Sturdy construction in this Ingersoll 2-Spindle Rotary Table Milling Machine permits feed rates in excess of 40"/ min. and makes possible the extra fine finish necessary in flat iron milling.

2. Automatic work holding devices make it easy for the operator to keep pace with the production of 450 an hour.

3. Ingersoll Shear Clear carbide tipped cutters on the business end of the milling spindles answer the demands imposed by high feed rates and excellent finish requirements.

4. Machine, fixture, and cutters designed and built into one productive unit is an advantage available to you in Ingersoll equipment.

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U. S. A.

This 12,500% increase *sounds fantastic!*

But True!

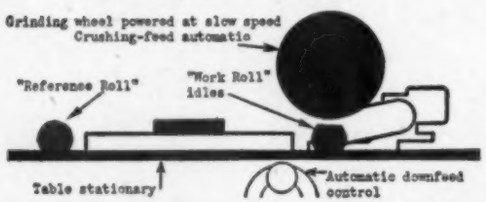
One of the major drawbacks to crush form grinding precision flat form contours has been the inability to produce on a practical production basis. This obstacle has been eliminated in two ways by the new Thompson Truforming Process.

First: Truform Grinders are engineered and built as a single unit, eliminating the failures of make-shift crushing arrangements and attachments.

Second: TWO CRUSHING ROLLS ARE USED. This is a major advancement, because it greatly extends crushing roll life and makes possible, for the first time, quantity production without constantly disturbing the set-up to re-process the crushing roll.

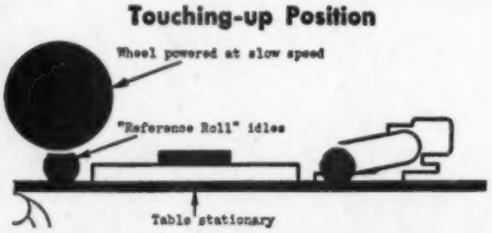
How two rolls operate in the Truforming Process is briefly illustrated and described below. The normal crushing or truing position is shown first.

Normal Crushing Position
Also Truing or Dressing



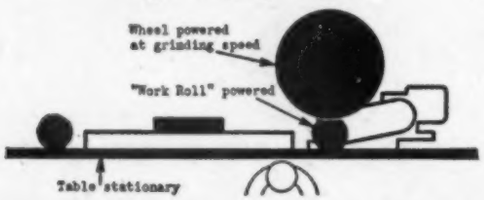
This is the position for the initial crushing of the wheel—and for subsequent truing or dressings when production grinding. On an eight pitch modified buttress thread form, 125 dressings were provided by the "work roll" before losing form.

Touching-up Position



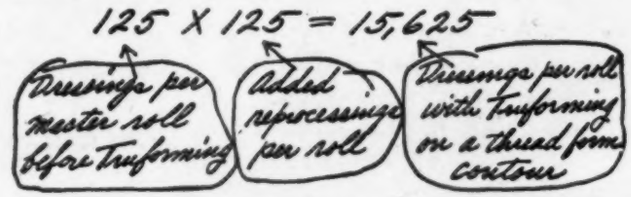
When the "work roll" loses form the table is moved to bring the grinding wheel over the "reference roll" for touching up, as shown above.

Re-processing Position



Because both rolls are table mounted, are in perfect alignment, and can be brought in the same relation to the grinding wheel, the original degree of accuracy can be quickly transferred from the "reference roll" back into the grinding wheel [illegible] and then ground back into the "work roll" as shown above.

The machine is then ready for production grinding again without disturbing the set-up or removing anything from the machine. In this way the "work roll" can be re-processed whenever it loses form and can be used for hundreds of additional dressings, or until it is worn out. Duplicate crushing rolls can be ground in the same way on all Thompson Truform Grinders.

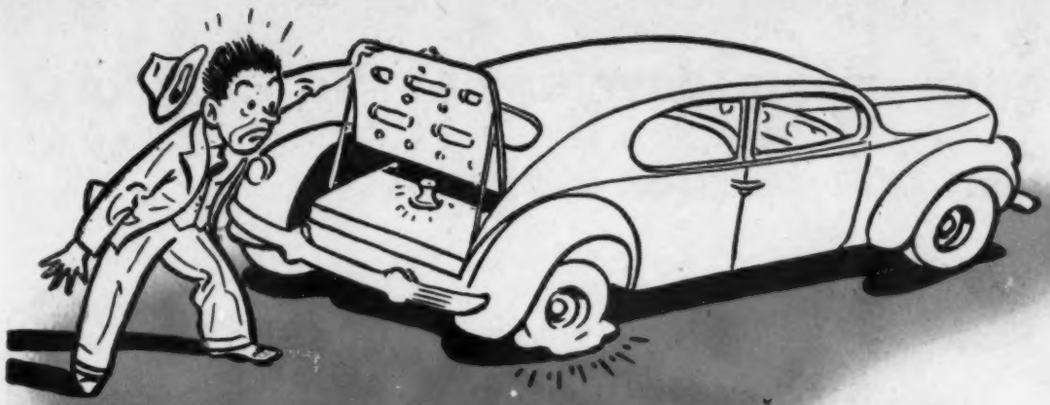

125 X 125 = 15,625
Dressings per master roll before Truforming
Added reprocessings per roll
Dressings per roll with Truforming on a thread form contour

What this means in savings is illustrated by the following example, involving a modified buttress thread form with an eight pitch form. Where two rolls are used in the Thompson Truform Process, it was possible to get *over 15,625 dressings* from the "work roll" before it was worn out. This meant an increase in continuous production (without changing or disturbing set-up) of 12,500%.

Write for the new 8-page Truform Leaflet—"Why didn't you tell me about this process before?"

Address Dept. 10

The Thompson Grinder Company • Springfield, Ohio



WOULD YOU DRIVE WITHOUT A *Spare?*

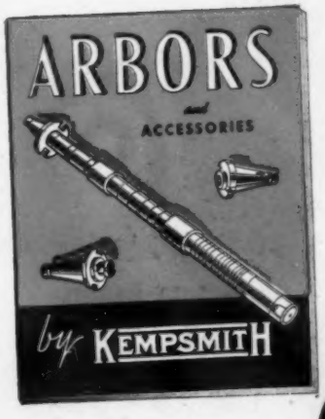
"Just my luck! A flat tire and no spare! What a predicament!"

A machine shop foreman may be in a worse predicament without a spare arbor. When an arbor breaks, production ceases until the arbor is replaced. Machine and manpower hours wasted! Schedules disrupted! Deliveries delayed! That's why we say —

It Pays to Have Several Arbors in Stock

Arbors are "perishable tools" and today their cost is relatively small in comparison to lost hours and disrupted schedules. So play safe! Order your spare arbors today. Remember, Kempsmith Arbors are now available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle.

THE KEMPSMITH MACHINE CO. • 1821 S. 71st Street • Milwaukee 14, Wisconsin



Get Your Copy of this NEW ARBOR BULLETIN

Describes the complete Kempsmith line of Arbors and Accessories. Also gives you helpful information on how to keep your arbors in condition. Fill in and mail coupon — today. No obligation.

Arbors BY KEMPSMITH

Precision Built Milling Machines Since 1888

Write Today!

KEMPSMITH — Yes, I would like to receive a copy of your new Arbor Bulletin:

NAME..... TITLE.....

FIRM..... ADDRESS.....

A 4594-1P-C

The most outstanding development in 20 years for machining non-ferrous metals...

The New Warner & Swasey

ACTUAL SHOP EXPERIENCE SHOWS THESE AMAZING RESULTS

THE R. PERLICK BRASS CO., Milwaukee, invested in a new Warner & Swasey Electro-Cycle a few months ago for machining their brass specialties, brewers' fittings and beer dispensing equipment. On the basis of this one machine's outstanding performance, they have since purchased 2 additional Electro-Cycles.

3 New Electro-Cycles Replace 6 Old Turret Lathes

When work that was formerly produced on Cone Head Ram Type Turret Lathes was transferred to new Warner & Swasey Electro-Cycles, greatly increased production showed that the Electro-Cycles would *pay for themselves within 18 months.*

74.9% Production Increase

Twenty-two jobs turned out by the Electro-Cycle showed an average increased output of nearly 75%. This average covers the machining of at least 22,000 parts in large and small lots—from runs of 10,000 down to 100 pieces.

Tool Breakage Cut 15%

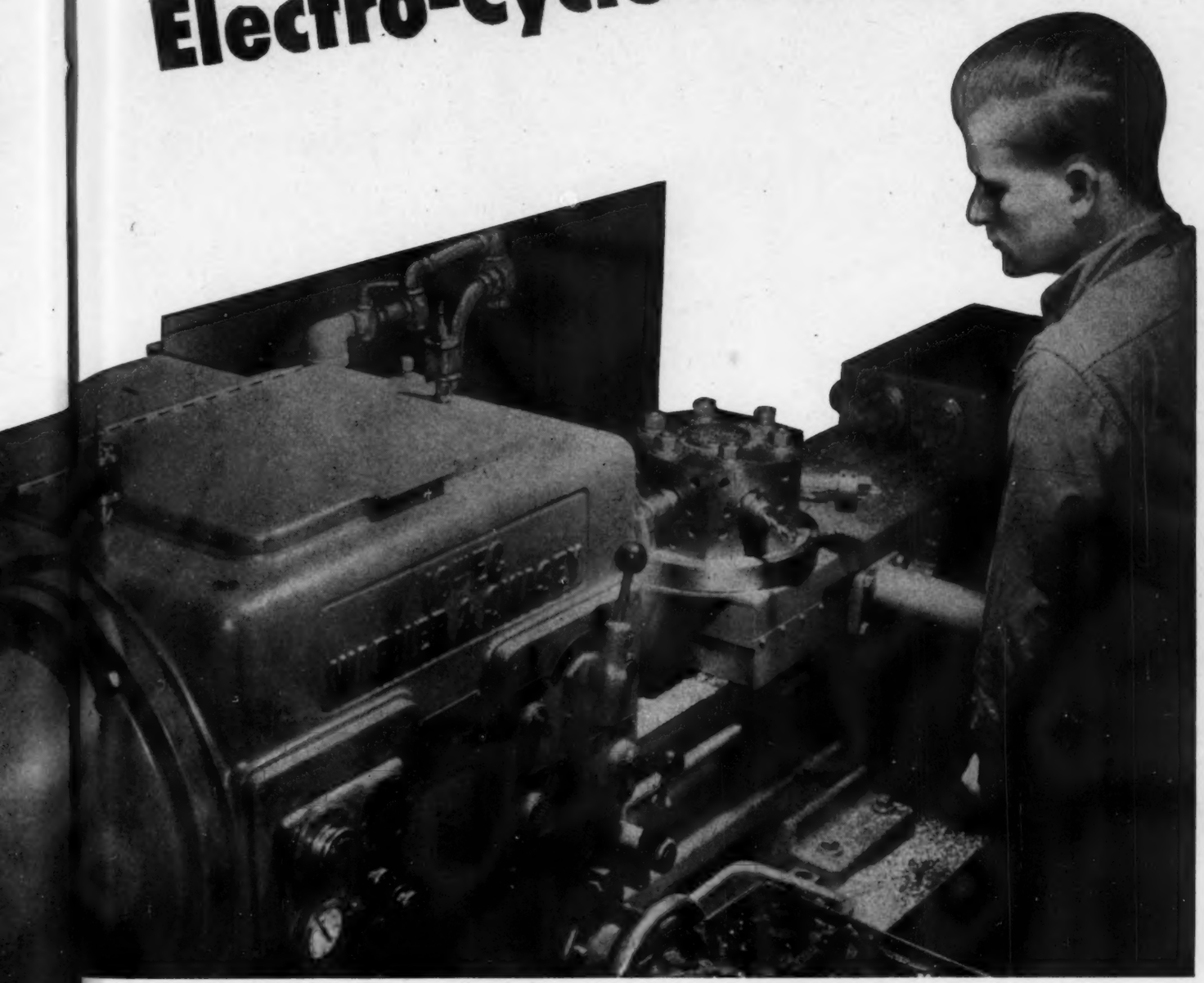
No new tools or chuck jaws were needed in effecting these production increases. Tools were simply transferred from old turret lathes to the new Electro-Cycles without need for adjustments. Sharp reductions in tool breakage, together with easier maintenance now result in a minimum of down-time in this shop.

Operators Report 50% Less Fatigue

The Electro-Cycle's completely AUTOMATIC SPINDLE CONTROL means less effort for the operator. These employees of the R. Perlick Brass Company say work fag has been cut at least 50% by their Electro-Cycles. Controls are so simple, even inexperienced men soon become capable and efficient operators.

TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

Electro-Cycle Turret Lathe



Here's Why the New Electro-Cycle Means Bigger Profits in Non-Ferrous Metal Turning

COMPLETELY AUTOMATIC SPINDLE CONTROL, exclusive with the new Warner & Swasey Electro-Cycle, results in less machine tool handling time —increases production with a minimum of scrap loss and tool breakage.

Push buttons preselect spindle start and stop, spindle reverse, and speed changes for any turret position. Manual operation of the headstock is eliminated. A wide variety of jobs formerly difficult and costly, can now be machined quickly and easily.

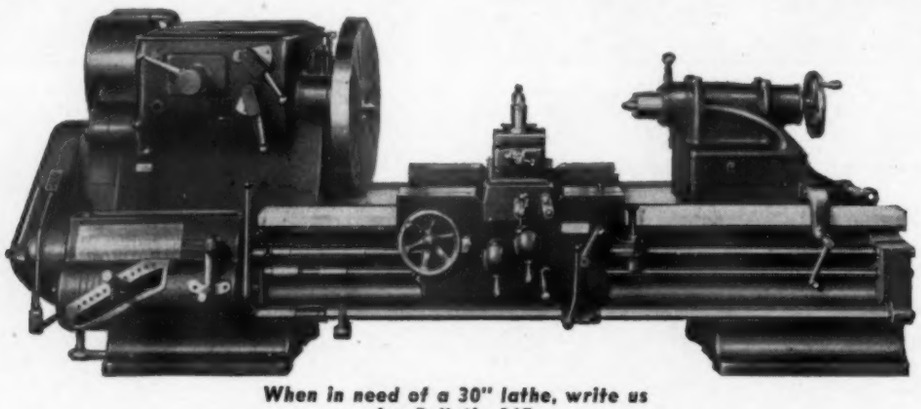
WARNER & SWASEY Machine Tools *Cleveland*

You Can Machine it Better, Faster, for Less... with a Warner & Swasey

Massive—

Springfield 30" Medium Duty Geared Head Lathe

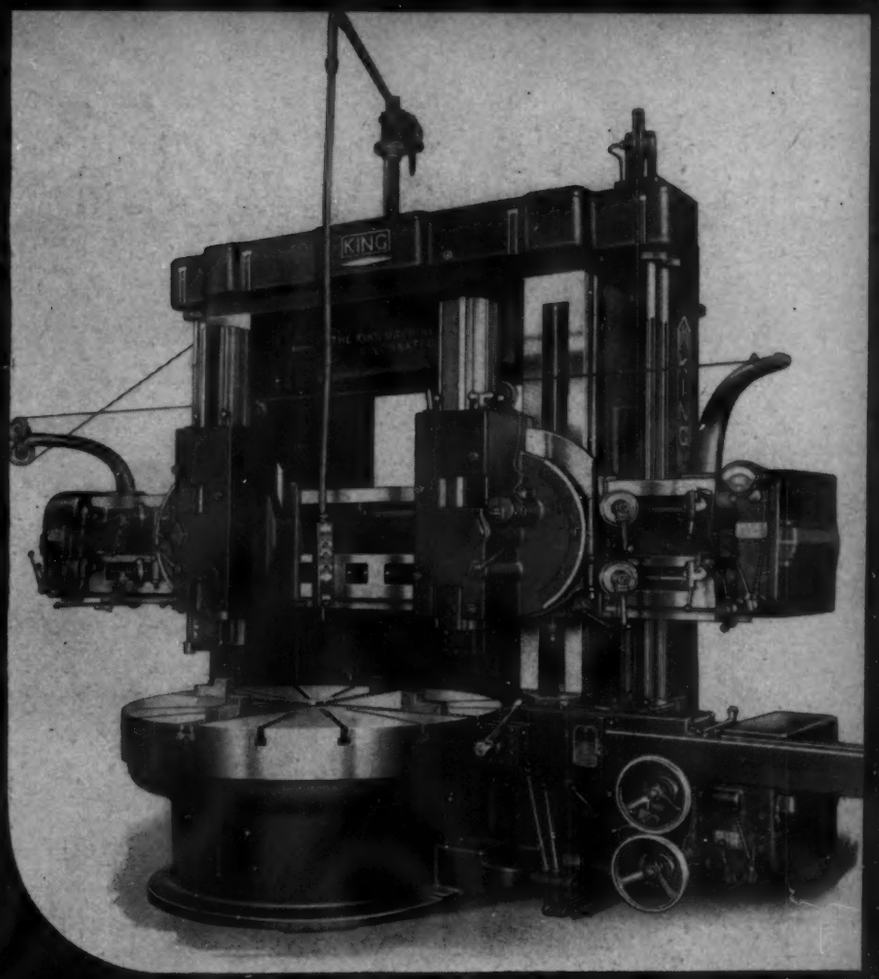
To handle those big jobs *and* the smaller ones choose Springfield Geared Head Lathes. Long, accurate performance is "built in" with the deep well-ribbed bed, with the nickel and chrome steel used and with the powerful massive design. Thirty-six changes of threads and feeds are available in the 30" lathe. Reverse gears are arranged to produce right- or left-hand threads without the use of wrenches and with a minimum of effort. Lead screws are tested to .001 inch to the foot and are used only for threads. A feed rod is supplied for all feeds.



When in need of a 30" lathe, write us for Bulletin 165.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD **OHIO, U.S.A.**



The New KING *Controls Pay off* IN TIME AND COST SAVINGS

● For example on the new KING the operator can select his speeds, set his feeds, rapid traverse the head to the job, make minute hand adjustment of the tool, start and stop the table—all from his normal work position. This centralization of controls and convenience of operation enables the operator to do a better job—easier—faster and at considerable saving in time and cost.

You will also be impressed by the massive proportions of the new KING, as the machine is substantially heavier offers a wide selection of feeds and speeds—is clean cut and modern in appearance.

And if you watch one of those new, husky ram heads hog off metal with carbide tools you'll know you are getting better results and that your selection of KING was a wise investment.

Available in ten sizes 30", 36", 42", 52", 62", 72", 84", 100", 120" and 144".

THE KING MACHINE TOOL COMPANY

CINCINNATI 29, OHIO

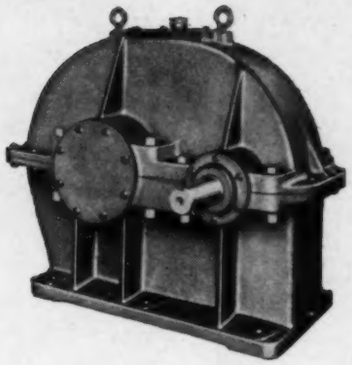
Builders of Vertical Boring and Turning Machines Exclusively

IF YOU'RE IN THIS 80%...

here are 6 advantages you need

WESTINGHOUSE

MEMBER OF AGMA



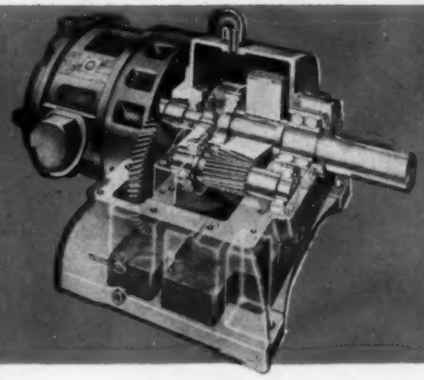
This Type SH speed reducer is a single-reduction unit which is furnished in thirteen standard ratios in each of twelve sizes. The Type DH speed reducer, which is a double-reduction unit, is offered in fifteen standard ratios in each of twelve sizes.

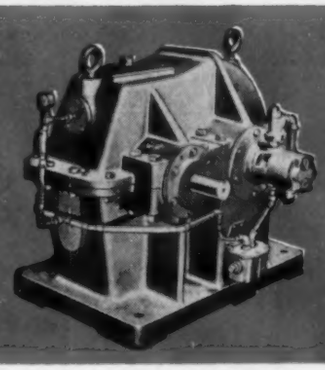
Since 80% of all machines run slower than their prime movers, you'll want to capitalize on the six benefits of the packaged designs in Westinghouse speed reducers:

1. Higher power efficiency (one plant boosted it from 80.9% to 85.4%).
2. Less servicing . . . only semiannual lubrication needed.
3. Maintain positive alignment of drive and driven machine.
4. Long service life through single helical gearing heat-treated by exclusive Westinghouse BPT process.
5. Minimum power loss with antifriction bearings.
6. Precision operation from hob-cut gears.

In addition, you get undivided responsibility with motor and gears supplied by one manufacturer. You have your choice of twenty-four sizes of Westinghouse speed reducers for drives up to 1,000 hp—Types SH and DH—with speed reduction ratios of 2.82 to 70.5.

Ask your nearest Westinghouse office today to show you how to get the best in speed reduction for your plant with Westinghouse speed reduction matched unit drives. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-07253





FOR DRIVES FROM 1 TO 75 HP

CHOOSE GEARMOTORS

For all types of drives, Westinghouse gearmotors offer peak performance in modern speed reduction. Easy to install, service and adapt to varied conditions. Three types—A, C, and E—supply output speeds from 1,450 to 16.5 rpm, all available with single-phase, polyphase, or d-c motors.

HANDLE ALL YOUR HIGH-SPEED JOBS

WITH THESE MATCHED-UNIT DRIVES

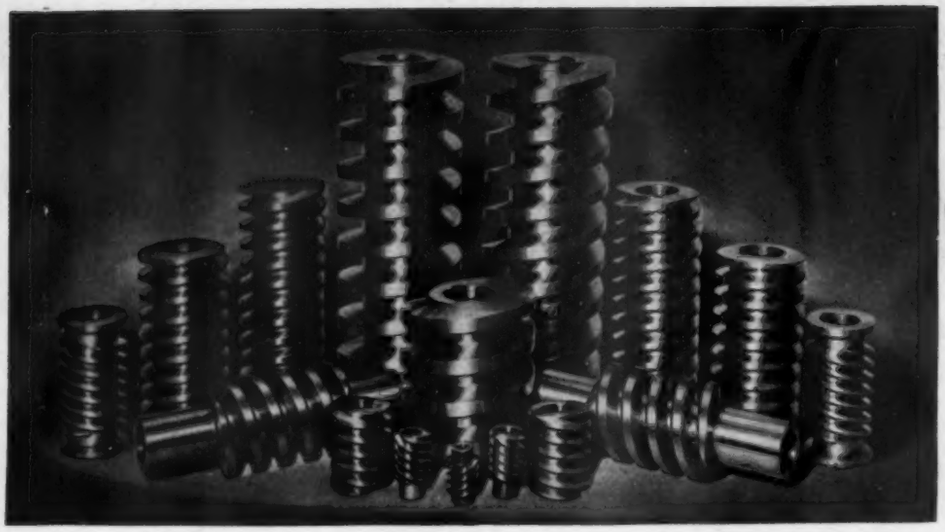
Now you can handle all your high-speed drives with these Westinghouse Type SU speed increasers for jobs up to 2,000 hp and 9,000 rpm. Units are available in 30 sizes—with gear ratios of 1.25 to 3.25 up to 2 to 12.

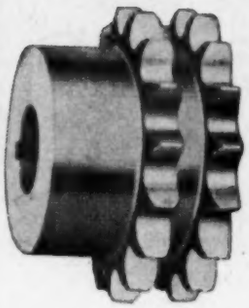
***Here's a complete picture story* of industrial geared drives and their uses in every industry. Ask for your copy of B-3730 today, on your business letterhead, please.**

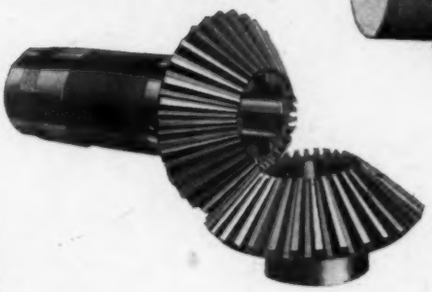
Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

4 out of 5 drives need speed reduction







the ADAMS line

- SPUR GEARS
- HELICAL GEARS
- BEVEL AND MITER GEARS
- WORMS AND WORM GEARS
- SPROCKETS
- INTERNAL GEARS (Spur and Helical)
- RATCHETS
- SPLINED SHAFTS
- RACKS
- LEAD AND FEED SCREWS
- GROUND TOOTH GEARS (Spur and Helical)
- SHAVED TOOTH GEARS (Spur and Helical)
- GROUND THREAD WORMS

Are you looking for ways to improve your product?

CHECK THESE ADVANTAGES OF ADAMS CUSTOM MADE GEARS

√ Made by skilled gear craftsmen.

√ Cut on modern precision machines.

√ Careful inspection and control throughout manufacture.

√ Exact conformance with your specifications.

Adams gears are made to suit the particular requirements of your product and to make that product perform as efficiently and dependably as possible. Investigate the advantages of Adams custom made gears for your needs. Write THE ADAMS COMPANY, 1942 Bridge St., Dubuque, Iowa.

The ADAMS Compa

Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1883

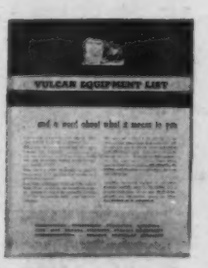
RECESSION

inflation or progression you will do better in any case with better *special* tools and machinery which top flight engineers can start designing or building

RIGHT NOW!

VULCAN TOOL COMPANY
730 LORAIN AVE., DAYTON, O.

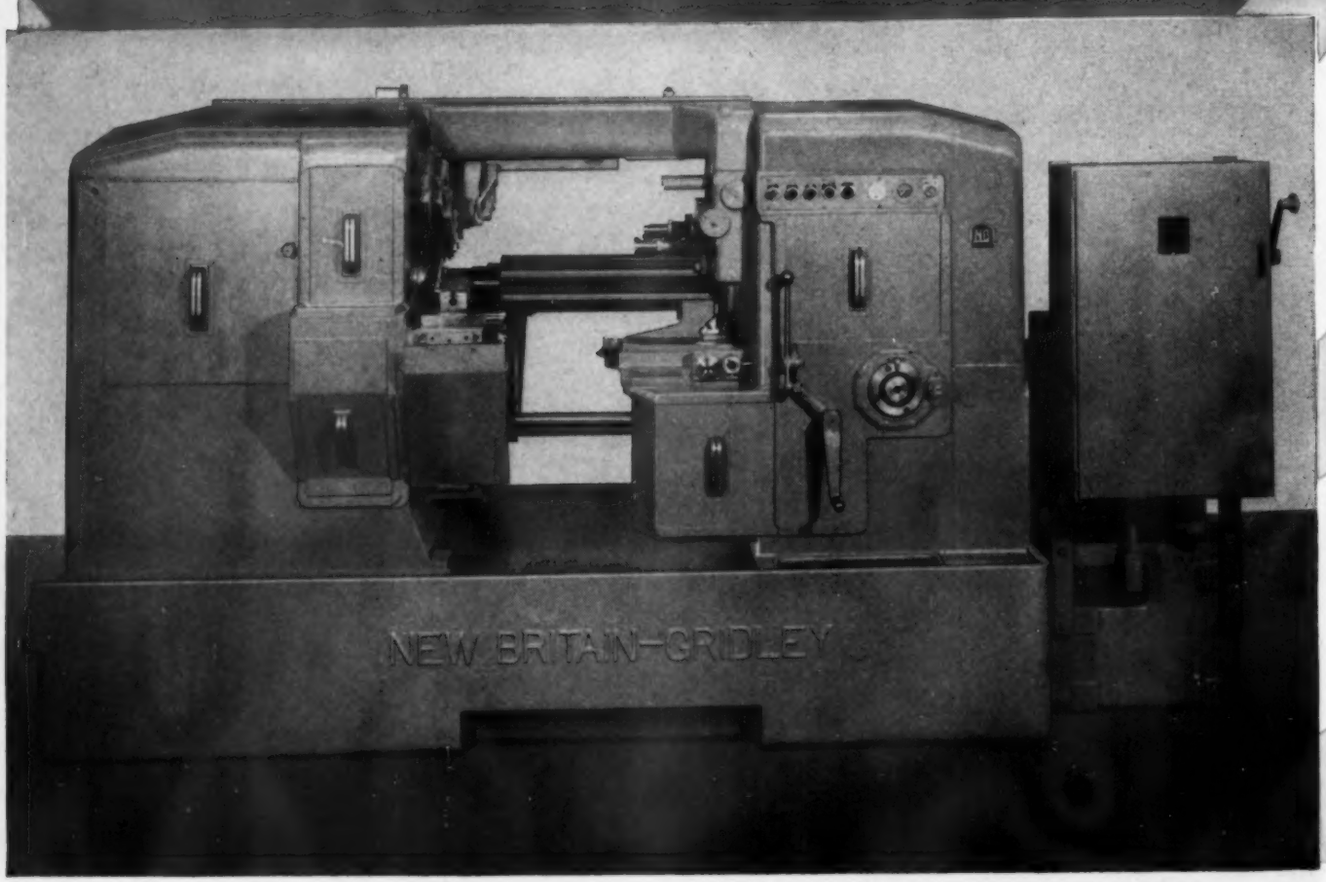
Write for this informative BULLETIN A. M. 5
Please indicate your production problem.

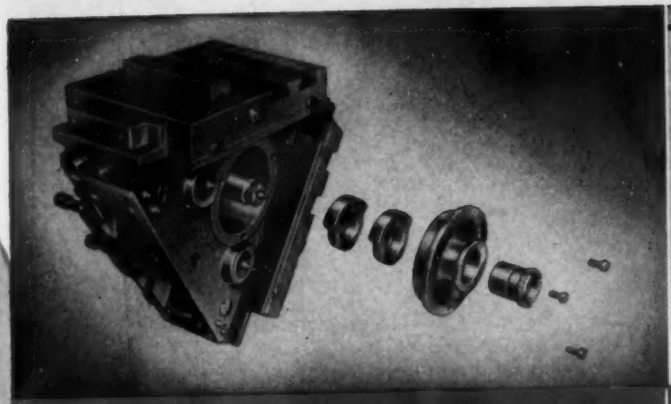


Announcing

A NEW LINE OF SCREW MACHINES

New Britain's answer to the need for lower costs and higher productivity





CROSS SLIDE CAMS. By removing three screws and the cover, the cams are ready to drop off. A supply of ten inexpensive cams covers the majority of jobs.

UNIVERSAL TOOL SLIDE CAM. No cams to change—by adjusting this calibrated dial, any ratio of feed to approach may be obtained. The high point remains the same. Therefore tool holders need not be repositioned or stops reset.

This new line of screw machines is the culmination of years of intensive research at home, and exhaustive testing in the field. The principles described here have been proved not only to our satisfaction, but also to the satisfaction of leading screw machine users.

Built massive to handle the horsepower required for steady feeds for carbides on tough forming steel jobs, they are also designed for super high-spindle speeds, essential for brass and aluminum. This has been accomplished without sacrificing the minimum indexing time inherent in all New Britain Automatics.

These new machines with their initial and permanent accuracy also incorporate all the previous exclusive features by which NEW BRITAINS are recognized. To these qualities have been added new features, making it possible to accomplish quick set-ups where short runs are the rule.

BUILT FOR LONG AND SHORT RUNS

By the use of the program wheel which tells the operator the location of the tool slide and all cross slides at all times, together with the universal tool slide cam and rapid change cross slide cams, a large portion of the normal time required for set-up is eliminated. With the use of the micrometer adjustment in both directions on all cross slide tooling, adjustable without influencing the stops, and with constant high point on all slides, the time for setting tools is reduced to a minimum.

Because of the constant high points on all slides, to rerun a job after its original set-up requires only a fractional part of the original set-up time.

CROSS SLIDE CONSTRUCTION

An entirely new construction of cross slides has been incorporated in the design of these machines. Each spindle position is provided with an independently operated cross slide, the first five being heavy duty forming slides, and the sixth for cut-off. The tool slide cam and all the cross slide cams are located directly back of their respective slides, eliminating the deflection existing in all types of linkage.

Symmetry is obtained by radial arrangement of cross slides, permitting complete interchangeability of tool slide tool holders and interchangeability among the five forming slides. Further flexibility is incorporated for auxiliary attachments permitting threading and accelerating attachments in the last three positions.

A fast, powerful machine which will outperform anything modern tools will handle and anticipates future tool developments.

QUICK SET-UP

TIME FOR CAM CHANGES ELIMINATED FOR ALL PRACTICAL PURPOSES.

1. Graduated hand wheel in front of machine to adjust travel for any feed stroke of tool slide.
2. Cross slide cams require only the removal of three screws for each pair of cams.
3. No cam changes required for change in stock feed length.
4. Micrometer adjustment on all cross slides in both directions, all independent of stops.

A CHANGE IN SET-UP DOES NOT REQUIRE

1. A change in stops—they remain constant.
2. A change in high points—they remain constant.
3. A change in drawback points — they remain constant.
4. A change in total stroke—it remains constant.
5. A sacrifice of working time — it remains constant.

ON ALL CROSS SLIDES AND MAIN TOOL SLIDE.

THE NEW BRITAIN MACHINE CO.

NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Look at this Allen-Bradley solenoid starter...notice the simple switch mechanism . . . no pins, pivots, hinges, bearings, and jumpers to gum up or corrode. No trouble-making parts to interfere with the dependable action of the solenoid plunger. The double break, silver alloy contacts require no maintenance attention . . . no cleaning, dressing, or filing. There are standard cabinets to meet all shop requirements . . . general purpose, watertight, dustproof, etc. Send for bulletins. Allen-Bradley Co., 1310 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

prolific perfectionist

The Bryant No. 109 Internal Grinder produces rapidly, automatically and in volume such parts as ball bearing races, gears, rolls and bushings with bore sizes up to 3". It *automatically* rough grinds, trues the wheel, finish grinds and stops when finish size is reached. Bore size is also controlled *automatically* by the wheel trueing diamond or by a plug gaging unit operating through the work spindle. Thus the operator need only load the work, trip the cycle lever and then unload the finished part — often operating two machines with little effort.

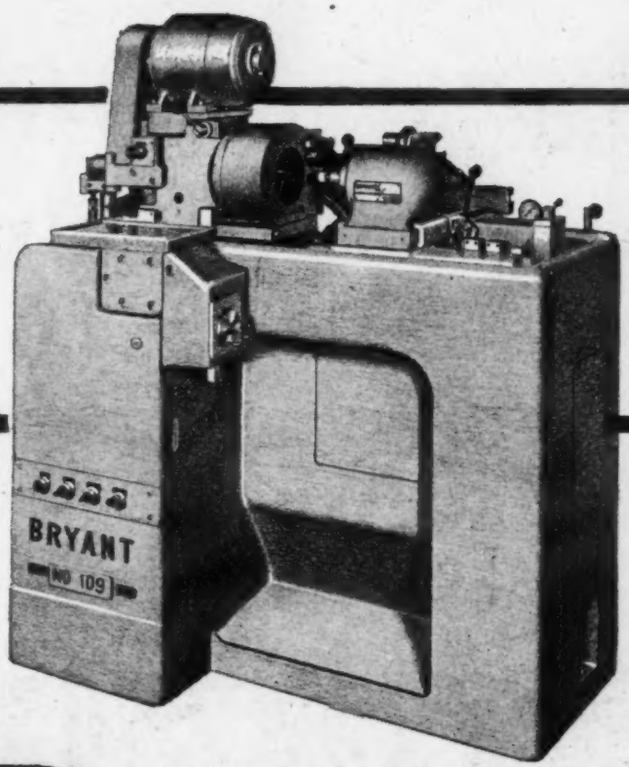
Exclusive Bryant set-up features include split-second cycle control of the wheel-slide through four adjusting throttles. Timing devices for "spark out" are provided for both rough and finish grinding. Hydraulic motors give infinitely variable work speeds and cross feeds. Preloaded ball bearing sealed slides for longitudinal and cross motions give super-smooth control of work and wheel. For proper cutting characteristics on extremely small bores, the Bryant Hi-Frequency Wheelhead offers speeds up to 100,000 r.p.m. Belt-driven spindles are used for the larger range of bore sizes.

The No. 109 is a high production machine, yet grinds bores to the finest tolerances and with work finishes of unbelievable accuracy. For details on this "Prolific Perfectionist," write for catalog.

NUMBER 109

Automatic

INTERNAL GRINDER

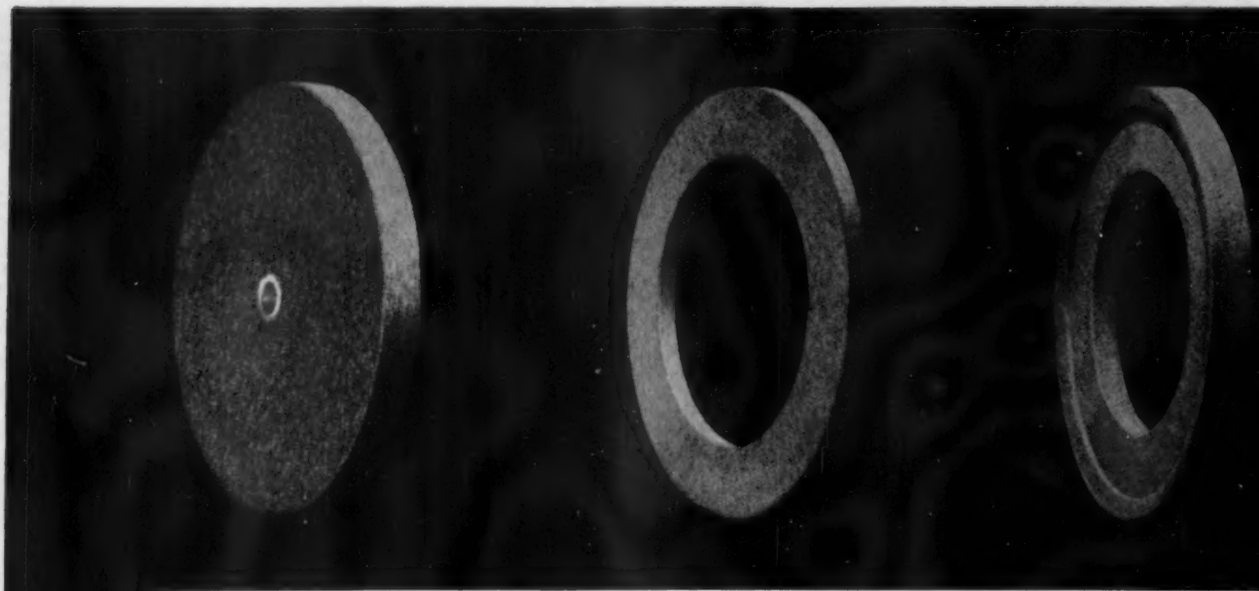


Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT



Production really rolls with job-designed wheels

Are you interested in speeding up production—in smoothing the rough edges on your grinding bill?

Then consider your grinding wheels. Production really rolls when you use the *right* wheels. But production creeps and falters when you use *wrong* ones. And it all shows up on the records.

For 58 years, men in your industry have been getting the right wheels and faster production by consulting Peninsular.

Call in Peninsular engineers on your job. They will study your grinding thoroughly. From this study, they will develop job-designed grinding wheels for best possible results at lowest possible costs. *Every* Peninsular grinding wheel is specially made for its particular job.

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7, *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

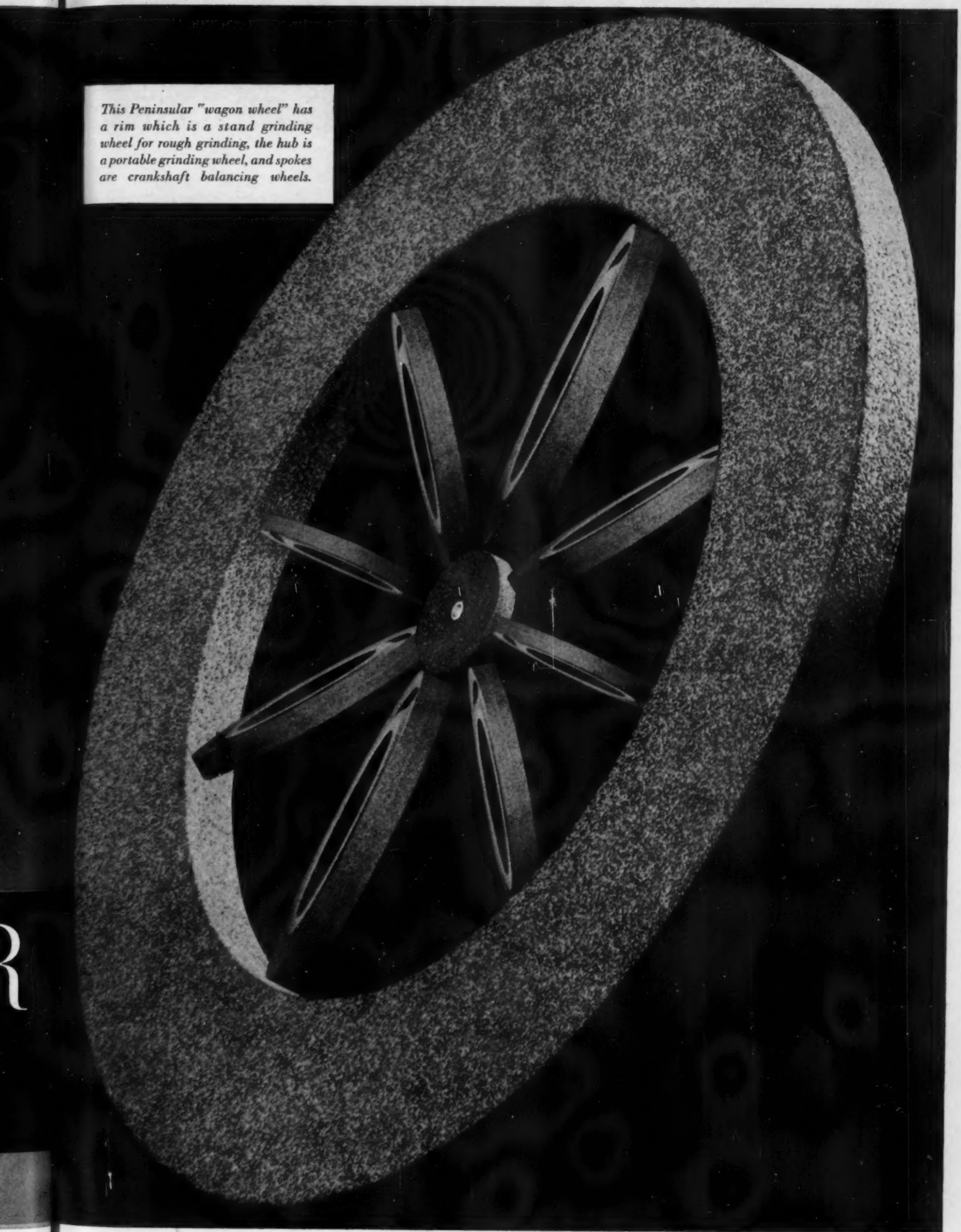
PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

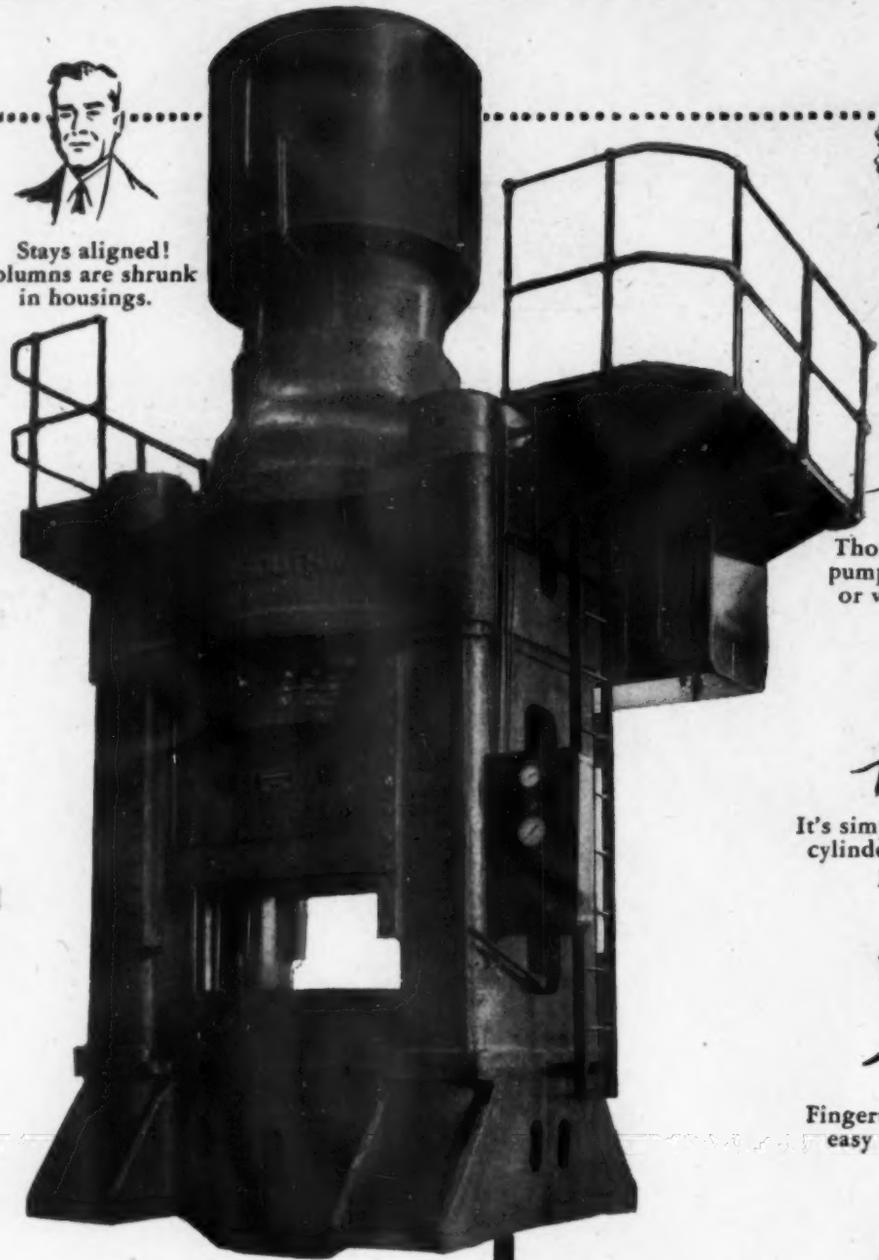
SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



This Peninsular "wagon wheel" has a rim which is a stand grinding wheel for rough grinding, the hub is a portable grinding wheel, and spokes are crankshaft balancing wheels.

Everybody's Talking
about BALDWIN HYDRAULIC PRESSES



Stays aligned! Columns are shrunk in housings.

Those high capacity tanks are good...

Saves power—main cylinder fills on idle stroke.

It's wear-proofed. Bronze cylinder and gland bushings!

Those die cushions are easy to adapt for stripping!

A dependable name—no risk of "Orphan" equipment.

High Production! That's what we need!

Those radial piston pumps give pressure or volume needed.

It's simple to service—cylinders are outside packed!

Fingertip control—easy to operate.

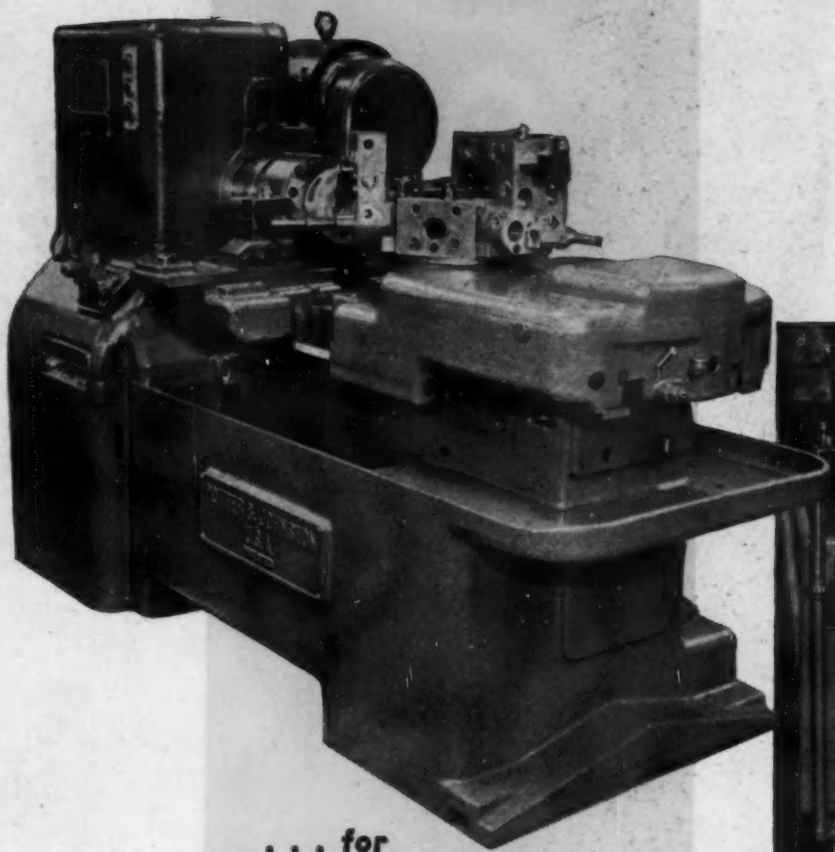
That hand control handles inching or die setting.

Designed to meet today's production needs, and engineered by one of the oldest and largest press manufacturers, Baldwin Southwark Hydraulic presses have something extra to offer you in the way of appealing features. Experience gained in producing all types of metal presses provides the right answers, right away, to your individual problems. The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A. Offices: Philadelphia, New York, Boston, Norfolk, Birmingham, Houston, St. Louis, Chicago, Cleveland, Detroit, San Francisco, Washington, Pittsburgh, Seattle.

BLW THE BALDWIN GROUP

BALDWIN
SOUTHWARK
HYDRAULIC PRESSES

The New P&J-3U SPEED-FLEX AUTOMATIC TURRET LATHE



View of head end of the P&J 3U Speed-Flex Automatic Turret Lathe.

. . . for the fast, accurate, convenient and economical production of small parts in quantity

ALSO BUILDERS OF 4D, 4DE, 5D, 5DE, 5DL, 5DEL, 5D2-9", 5D2-12", 5D2-15", 6DRE, 6DREL, 6DRELX, 6DS, 6DSE, 8DT, 8DXT, 9D. 11 MODELS WITH 4, 5, 6 TURRET FACES OPTIONAL. 7 MODELS WITH 6 TURRET FACES STANDARD.

HERE at last is a chucking machine scaled down in size to fit it to the job of handling small work. It embodies every modern feature of larger machines plus developments which experience has shown are essential to maximum performance and convenient operation with modern cutting tools. Like all P&J machines, the New 3U Speed-Flex Automatic Turret Lathe provides a versatility in tooling which adapts it to the wide range of work within its capacity.

Note the following features:

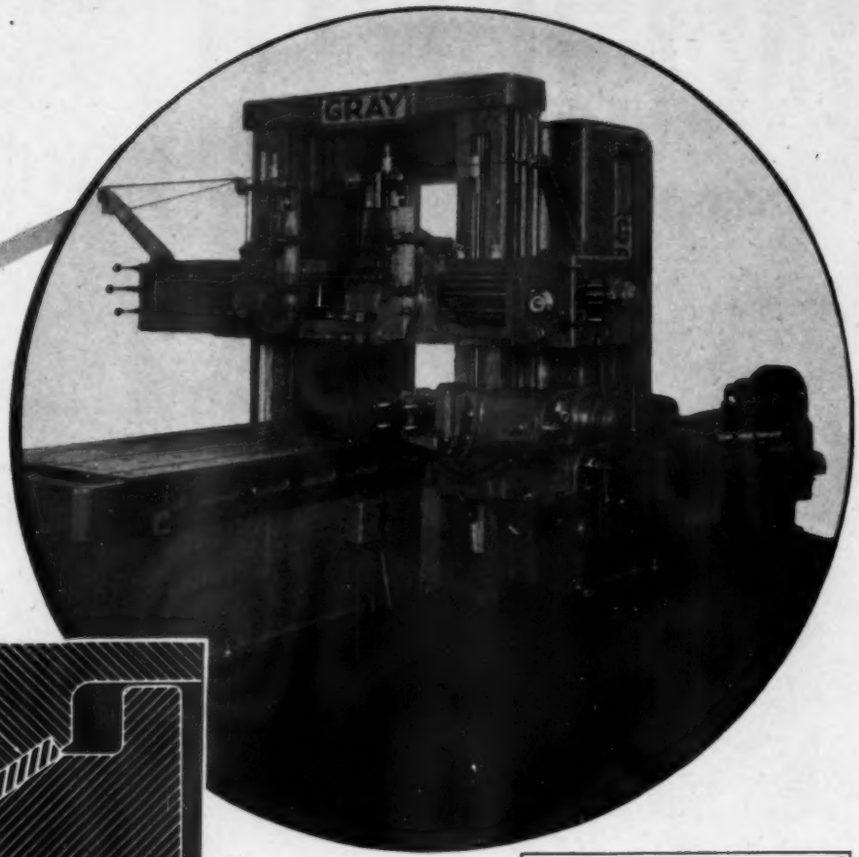
. . . Modern, rigid construction with box-form base.
. . . liberal provision for chip clearance and coolant supply.
. . . hardened and ground steel ways for turret slide are mounted on base.
. . . hardened and ground steel inserts in turret slide.
. . . heat treated and shaved gearing of chrome vanadium steel.
. . . cascade oiling of all bearings and gearing.
. . . gear box insulated from machine.
. . . automatic pressure lubrication of turret slide and bed ways.
. . . ample speed and power for use of tungsten carbide tools.
. . . six turret faces, standard. (Hollow turret.)
. . . 8" air chuck and 8" air cylinder standard equipment.
. . . automatic stop at completion of work.
. . . capacity: work up to 6" diameter and 4" long.
. . . full electrical control.

Complete detailed specifications and features available promptly on request.

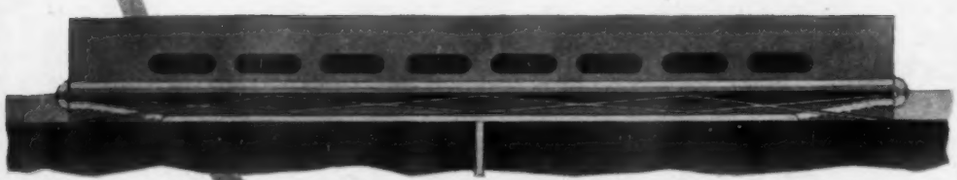
POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R. I.

Pioneer Manufacturer of Automatic Turret Lathes

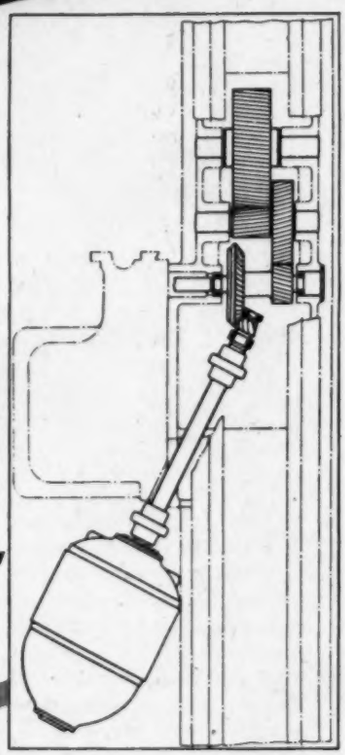
3 OUTSTANDING GRAY FEATURES



STOP SCORING *with the Gray Non-Metallic Ways*

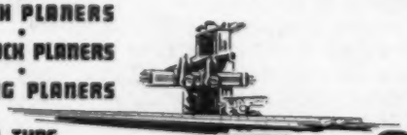


INSURE PROPER LUBRICATION *with Gray Loop Lubrication*



SAVE SPACE *with the Gray Space Saver Drive*

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

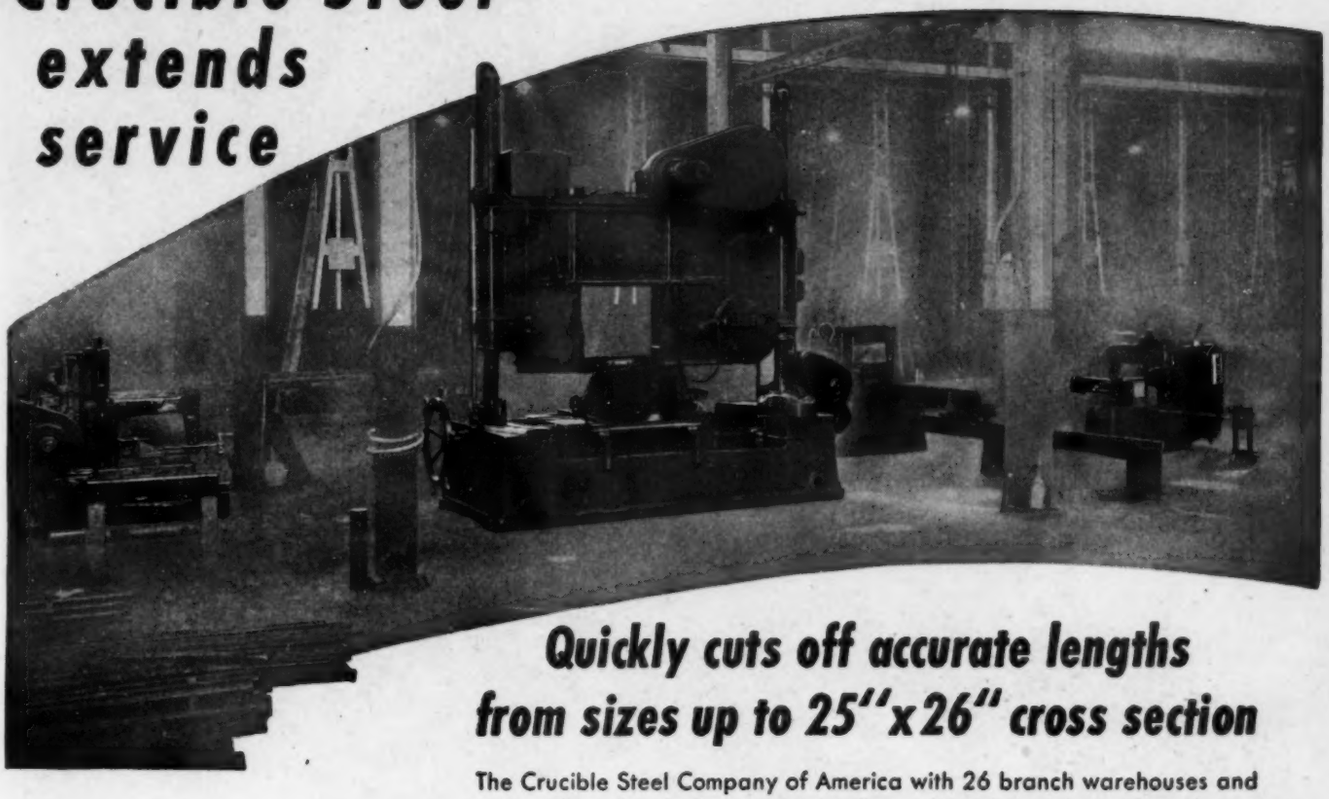


The G.A. GRAY Co.

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Crucible Steel extends service



Quickly cuts off accurate lengths from sizes up to 25"x26" cross section

The Crucible Steel Company of America with 26 branch warehouses and sales offices, has built a reputation for anticipating customers' needs, not only in high grade and special steels, but in service requirements as well. They were among the first to equip several of their warehouses with modern high speed MARVEL Saws (No. 6 and 9A series) in order to give fast service on either single lengths or large quantities of identical pieces, accurately cut from bars up to 10" x 10" cross section. Now in anticipation of new demands for larger sizes, they are the first steel company to install a No. 24 MARVEL Hydraulic Hack Saw in order to give fast service on orders for steels of any type *in sizes up to* 25" x 26" cross section.

This giant hack saw, which almost qualified as a "secret weapon" because it contributed so materially to our production capacity in building naval ordnance, applies an entirely new principle of reciprocation that has made "hacksawing" of large work practical for the first time.

Whatever your metal sawing problems, there is a MARVEL Saw exactly suited to your needs. A MARVEL field engineer will be glad to go over your metal sawing problems with you.

No. 24 MARVEL giant Hydraulic Hack Saw. (capacity 24" x 24"). Employs new "Roll Stroke" sawing action and trouble-free low pressure hydraulic control.

No. 9A MARVEL Production Saw (capacity 10" x 10"). Automatically feeds, measures and cuts-off identical lengths from single or nested bars with no more operator attention than an automatic screw machine.

No. 6 MARVEL Saw (capacity 6" x 6"). A high-speed, heavy-duty, all-ball-bearing saw—operates up to 149 strokes per minute, cuts thru 64% of each stroke, returns in 36%.

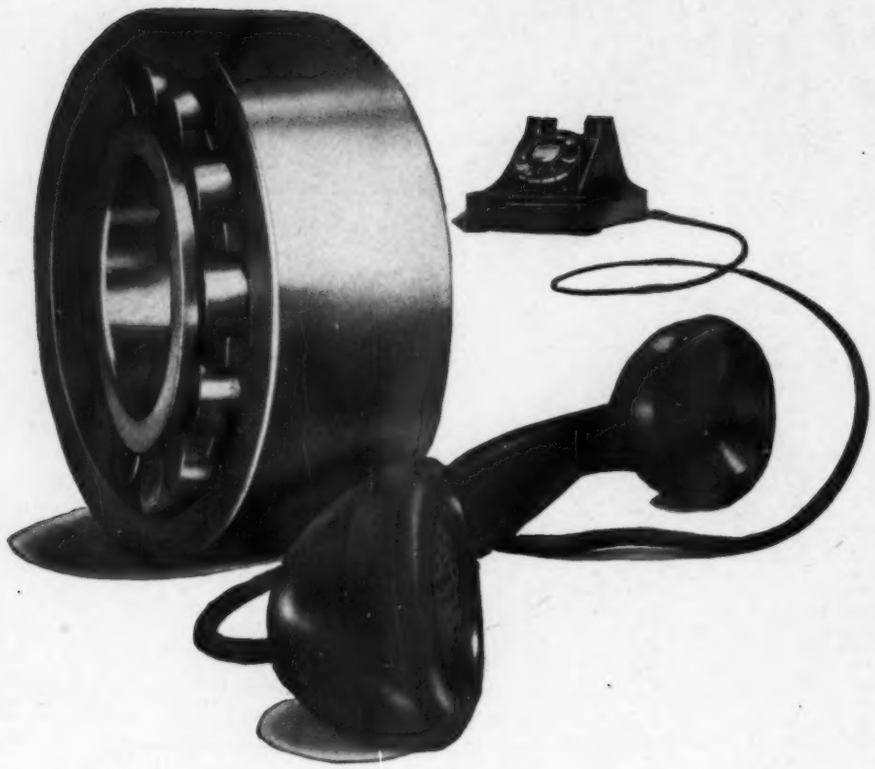
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE, CHICAGO 39, U.S.A.

No. 1, No. 2 Series Capacity: 4"x4" Capacity: 6"x6" | No. 4B Series Capacity: 6"x6" | No. 6 Series Capacity: 6"x6" | No. 9A Series Capacity: 10"x10" | No. 8 Series Capacity: 18"x18" | No. 18 Series Capacity: 18"x18" | No. 24 Series Capacity: 24"x24"

MARVEL SAWS



Unit construction . . .

is a familiar feature of the modern telephone handset which is equally advantageous in the Torrington Self-Aligning *Spherical* Roller Bearing. Its unit design

Assures easier handling . . .

speeds assembly, cuts installation and maintenance costs. In addition, the *Spherical* Roller Bearing features high radial capacity, two-directional thrust capacity and free-rolling self-alignment that assures efficient operation under conditions of shaft deflection or similar causes of misalignment.

You can turn these and other important advantages to your benefit. Send for our Bulletin #200, which contains complete engineering data on the *Spherical* Roller Bearing.

THE TORRINGTON COMPANY

SOUTH BEND 21, INDIANA TORRINGTON, CONN.

Offices in All Principal Cities

TORRINGTON BEARINGS

• NEEDLE • SPHERICAL ROLLER • STRAIGHT ROLLER • TAPERED ROLLER • BALL •

EVERY FACILITY FOR THE OPERATOR

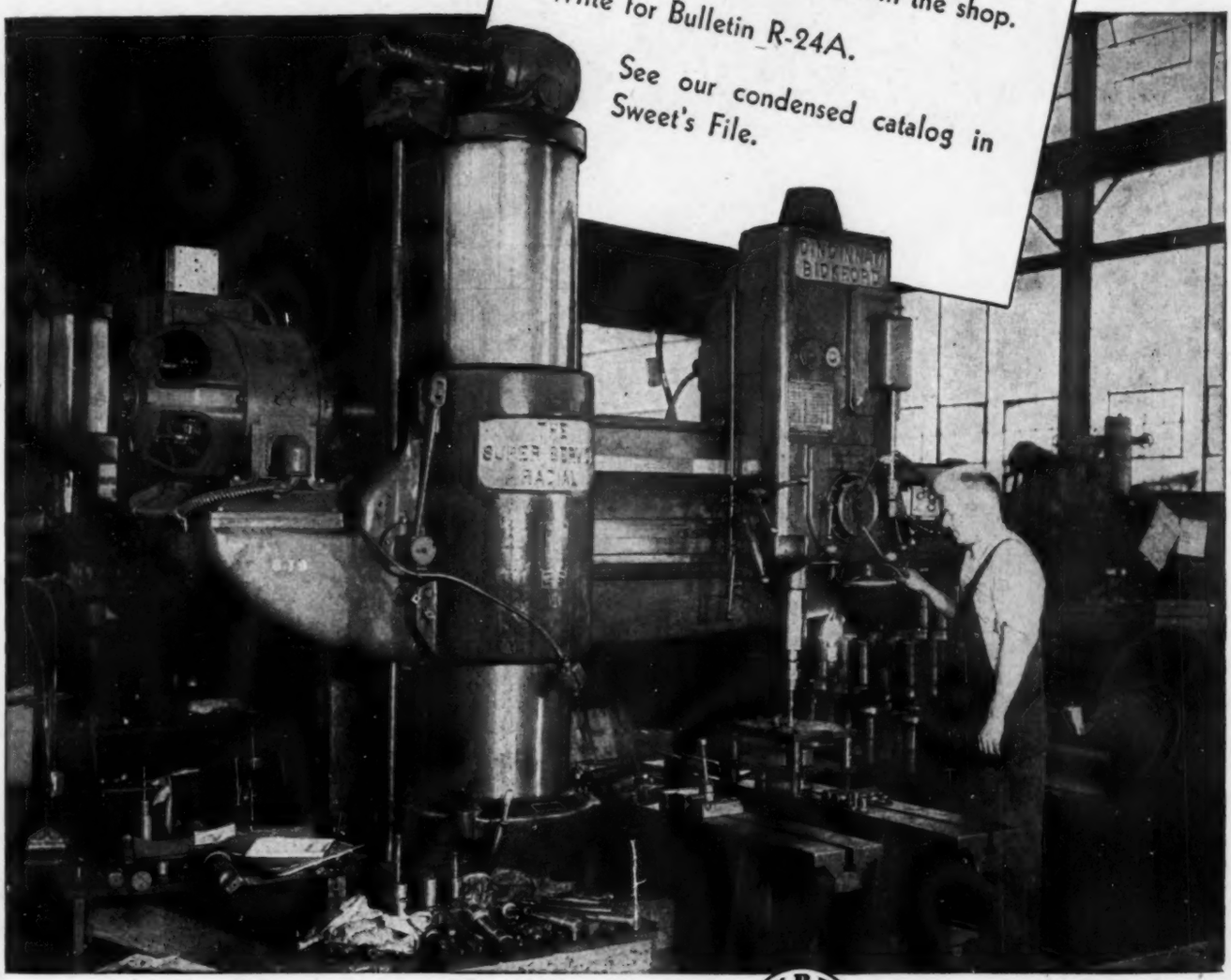
Concentrated controls on the head at the point of operation are smoothing the job for the operator—he is working to a tolerance of .0005".

Walter Scott & Co., Inc., Plainfield, N. J., say the capacity, performance and ease of change from job to job of their Cincinnati Bickford Super Service Radials are outstanding.

Cincinnati Bickford Super Service Radials are profitable tools in the shop.

Write for Bulletin R-24A.

See our condensed catalog in Sweet's File.



Equal Efficiency of Every Unit Makes the Balanced Machine

RADIAL AND UPRIGHT SUPER C B SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

PRESS PRODUCTION

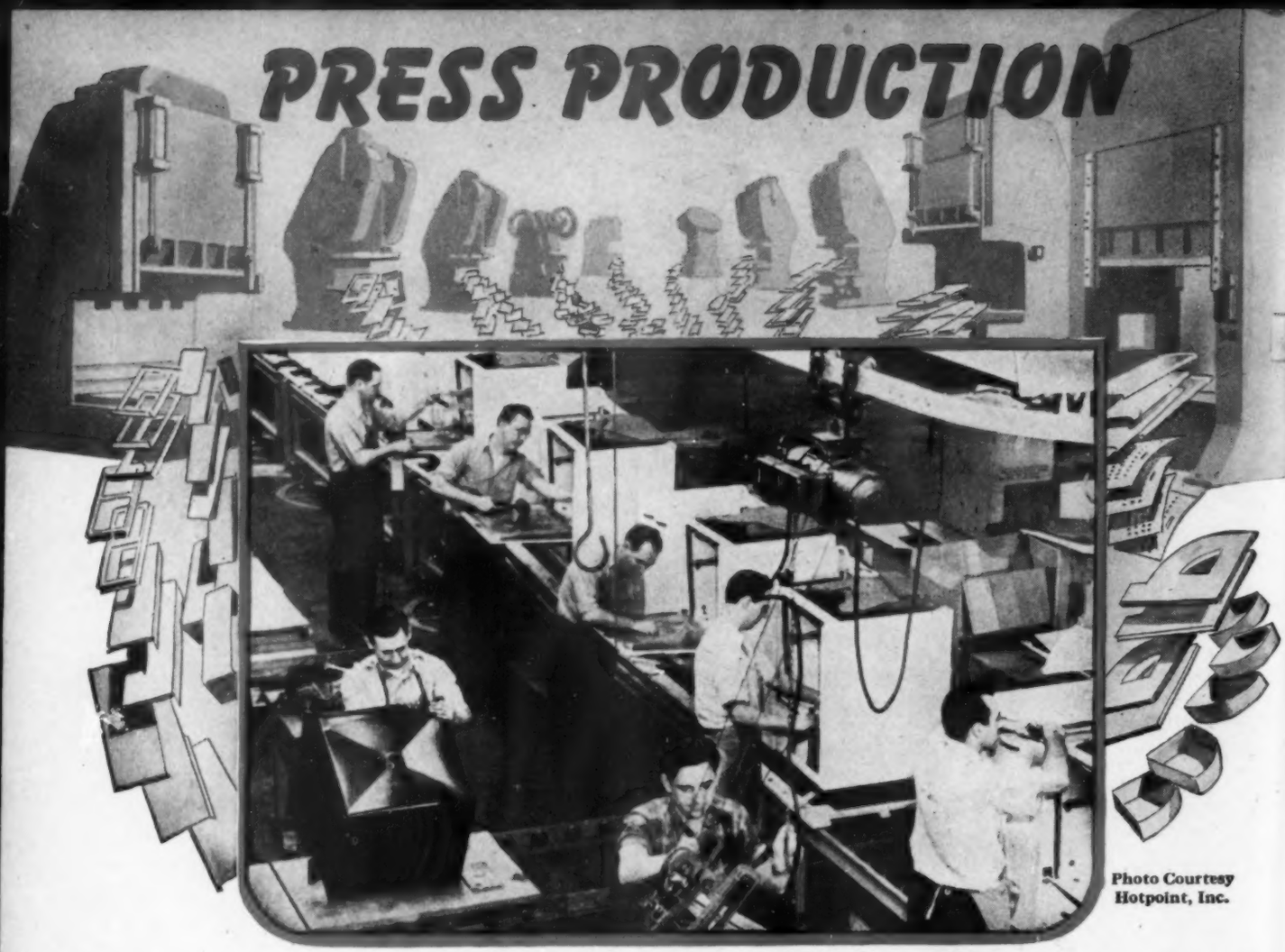


Photo Courtesy
Hotpoint, Inc.

FEEDS THE ASSEMBLY LINE

The Assembly Line—symbol of American Mass Production—depends on a rapid and constant flow of finished parts to each stage of the assembly.

Largely responsible for keeping the line moving, Presses provide the fast, all-around production of duplicated metal parts that modern standards of production demand.

Danly Die Sets—a *necessary part of good Presswork everywhere*—speed die making programs, protect costly dies, cut down time for regrinds. Danly Die Sets and Die Makers' Supplies are nationally recognized for *known dependable accuracy*.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois

DANLY
National Assembly

Call Danly

- **MILWAUKEE 2**
  111 East Wisconsin
- **DETROIT 16**
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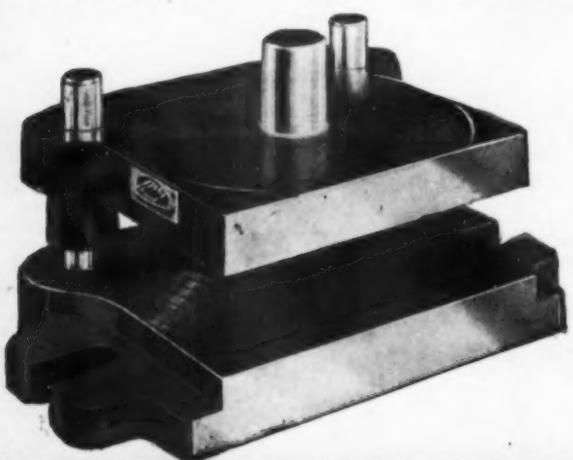
  1550 East 33rd Street
- **DAYTON 2**
  990 East Monument
- **ROCHESTER 4**
  16 Commercial Street
- **PHILADELPHIA 44**
  18 W. Chelten Avenue
- **LONG ISLAND CITY 1**
  47-28 37th Street
- **DUCOMMUN METALS & SUPPLY CO.**
  4890 South Alameda, Los Angeles



DIE MAKERS' SUPPLIES

DANLY DIE SETS

Welded Steel Fabrication

American Machinist's Spot NEWS OF METALWORKING

Micro Switch Division has a working replacement policy for shop equipment, even though average age of equipment is only 3½ years. Policy was broadened from one worked out for office typewriters, will avoid mass obsolescence and rising production costs.

Cemented brake shoe facing is being promoted by four of the largest rubber concerns and all of the automobile companies are experimenting with it. It is claimed such shoes will last the life of the average car when cemented in place. Biggest service problem is to remove the worn lining.

Australia is making postwar capital of wartime developments for rust and corrosion prevention. Oil, stainless steel and plastics were used by American technicians to battle the climate down-under. Sold on the methods of combating deterioration, Australia is importing necessary raw materials and adapting its own resources.

A Hartford electrical manufacturer has found increasing dislike among women operators for kick presses and forming presses on small parts. He has developed a small air press to replace them, reports increased production and general acceptance.

Russia has launched production of new-type Diesel-electric locomotives, featuring two trucks and six axles. Each axle is equipped with a traction motor. A 6-cylinder, 4-stroke-cycle, 1000-hp. Diesel engine, linked with the generator, is mounted in the middle of the locomotive frame. Russia plans to produce a total of 865 Diesel-electric locomotives by 1950.

The on-again off-again Chevrolet light car project is finally off. Announcement that it was "indefinitely postponed" was prompted by shortage of materials, both for construction of the plant at Cleveland and for car production once facilities were completed. This postponement was much more positive than previous interim delays. Development work has stopped this time, and apparently all phases of the project shelved.

Navy has developed flying boat hull design with about 50% less water drag and 20% less air drag than standard practice. In view are several types of waterplanes, including long-range bombers, assault transports, even flying LSTs. Program was prompted by serious lack of landing ground for heavy land planes in wartime.

Construction of a hot-air engine on a commercial basis has succeeded, according to reports from Holland. The engine, of revolutionary character, was developed after 10 years of strenuous work continued in greatest secrecy throughout the occupation. Featuring "outward combustion," the engine can be built in virtually any power volume and may be used for autos, locomotives, and for generating electricity for industry and home use.

Sudden strike against Ford Motor Co. by the Foremen's Association of America, an independent union, sharply focuses attention on the status of supervisory employees. Ford insists foremen are management members and this will be thrashed out in settlement. The strike is distinctive in **not** involving wages.

More vision will be engineered into automobiles, a trend started by Studebaker. Windshields will be curved from top to bottom as well as front right to left. Redesign of windshield wipers was one problem involved. Cars will take on a "low-and-round" appearance.

Tool and die shops in Detroit are finding the going lean. Some shops are closing for lack of tool and die work. Others are coasting along but see little likelihood of improved volume.

Maintaining standby plants for emergency in the face of budget cuts is perplexing to Army and Navy. They are seeking authorization to lease plants so designated to private firms who will pay for the housekeeping, etc. A major rub, from the standpoint of private interests, will be stipulations on how the leased plants must be maintained.

Buick is offering for the first time an automatic transmission for its current models now coming off production lines. Providing two speeds forward and one reverse, the transmission is of the hydraulic-torque converter type with simplified gearing and hydraulic controls.

Grind more pieces PER WHEEL DRESSING

AN EFFECTIVE grinding coolant must 1) settle grinding dirt quickly, and 2) prevent rust. Emulsions prepared with *Texaco Soluble Oil D* (or, where water is particularly hard, with *Texaco Soluble Oil HW*) have these two essential characteristics.

Quick settling of grinding dirt from *Texaco Soluble Oil D* emulsions prevents wheel loading and means increased production and lower operating costs. You can grind faster and smoother, get more pieces between wheel dressings and wheels last longer.

Emulsions with *Texaco Soluble Oil D* cool the work quickly, preventing distortion from frictional heat, and they leave the finely finished surface filmed with oil, thus effectively preventing rust.

You'll do more and better work with the help of Texaco Products and Lubrication Engineering Service. Call the nearest of the more than 2500 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

PREVENT SLUDGE AND RUST IN HYDRAULIC SYSTEMS

Users everywhere report smoother, more dependable hydraulic operation with *Texaco Regal Oils (R & O)*. These turbine-grade oils are specially processed to prevent foaming and contain inhibitors to prevent the rust and sludge formations that cause costly hydraulic stoppages.

TEXACO

TEXACO CUTTING, SOLUBLE AND GRINDING OILS FOR FASTER MACHINING

Tune in... TEXACO STAR THEATRE presents the NEW TONY MARTIN SHOW every Sunday night. See newspaper for time and station.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Pattern for Progress

While the British government has been exhorting its people to produce more, our attention has been called to a British metalworking plant which has discovered a way to higher productivity. And this has been achieved despite the reported war weariness of the British worker.

The method used by this plant was merely that of efficient management. This is what the company did:

It is an American-owned plant. The company relocated the factory, moving it from the London area to a small community. Then, surveying the management talent, it found that Britain is short of production engineers because few came into industry during the war years, and that there is a dearth of good production executives, at least on the basis of American standards.

To accomplish its purpose, then, the company sent over a complete corps of American-trained production executives and supervisors.

Now the workers in the new plant are producing more per man than before the war. They are alert, eager to do a job and trying to help. Their morale is high.

Cost comparisons between the new plant and the company's home plant in America (which is much larger) are favorable. After allowance is made for the lower wage rates in England and the higher materials prices there, production costs in the two plants are found to be almost equal.

If such rejuvenation can be accomplished in present-day Britain through improved management, why not here?

There are many manufacturers in America as well as in Britain who are not as alert and able as the company cited. If they do not mend their ways before the going becomes tougher in the competitive era ahead, they will run into plenty of trouble.

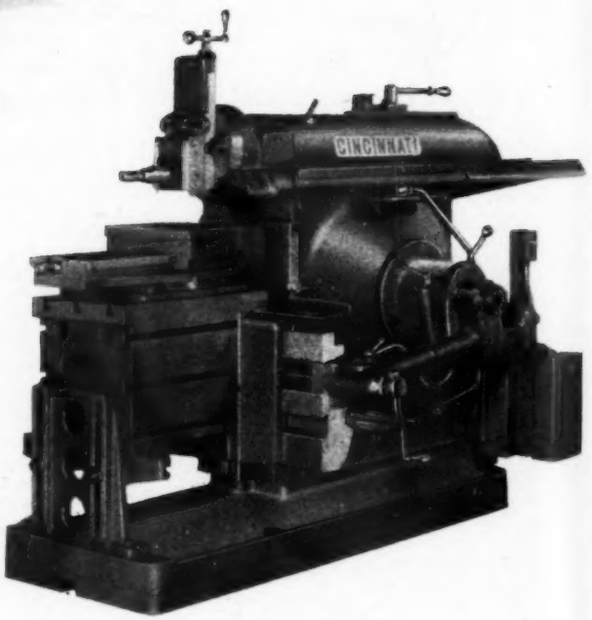
Good management is the secret of industrial success anywhere. The more our metalworking industries master the technique of good management and apply it to their businesses the better for everyone.

Burnham Finney

EDITOR

KNIVES
FOR THE IRON WORKER

Photo—courtesy Heppenstall Company



It's tough cutting to shape alloy steel knives for the Iron Worker.

Cincinnati Shapers have the power and stamina for this job—they are dependable, and where tough cutting is needed they turn in a fine performance.

On maintenance work, on small lot manufacturing, and in the tool room, they are profitable machines because they make a tough cut with accuracy, and are equipped for quick setups and easy, rapid control.

Write for Shaper catalog N-3, and the Bulletin Setups for Cincinnati Shapers.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Let's Have Free Depreciation

AN ILLOGICAL and unprofitable condition exists in government depreciation rates on machine tools and other production equipment.

Many large machine-tool users will not buy high-production units which do not pay out in a brief space of time—say three years, or two years, or even one year.

Shrewd manufacturers often purchase new machine tools which end their so-called "useful service life" long before they are worn out physically. These machines depreciate rapidly in value to the user, who would like to write them off quickly. But the United States Treasury Department adheres steadfastly and stubbornly to a straight-line depreciation policy which makes it difficult for a company to depreciate machines faster than a theoretical long-term "useful service life."

Few machine tools can be written off in less than 16 years, according to the terms laid down by the Treasury Department. And many types of machines must be amortized for tax purposes over a period of 21-25 years.

This old-fashioned policy has a sluggish and retarding effect upon modernization of metalworking factories. It sets up depreciation reserves at too slow a rate to conform to good manufacturing practices.

It leaves on the books of a company what appears to be a valuable asset—which actually is worth little. It influences financial officers, who often think in terms of accounting practices, to say "no" to the purchase of new, badly needed machines, when production officials, compelled to think in terms of obsolescence, are urging and pleading for an affirmative decision.

If depreciation rates are to be realistic instead of set in a rigid long-term mold, they must be flexible. There is no reason why these rates, upon which the federal government bases its taxes, should not be whatever the manufacturer decides to make them within the limits of sound business practice.

The manufacturer who gets more value from a new machine during the first three years of service should be allowed to write off a substantial portion of the machine's tax value during that period. He should not be compelled to string out the depreciation artificially over many years.

"What we want is the right to establish our own (depreciation) rates on any basis which is demonstrably reasonable in the light of our own business conditions," said Frederick S. Blackall, jr., president Taft-Peirce Mfg. Co. and chairman of the fiscal policy committee of the National Machine Tool Builders' Association, recently.

The term "free" depreciation sometimes is applied to this practice. That is, the manufacturer is free to establish rates to conform to his own production situation.

Allowance of free depreciation, says Herbert H. Pease, president New Britain Machine Co. and president, National Machine Tool Builders' Association, is a practical way of helping small and medium-sized manufacturers arrange their capital financing.

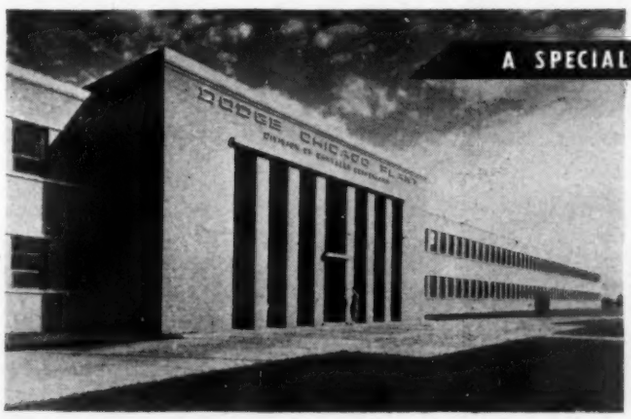
Accelerated depreciation is not new. Prior to 1934 the Treasury Department permitted manufacturers to decide what their own rates should be. If the rates were excessive, the Treasury had to prove them so. The prevailing policy then (which stuck nevertheless to the straight-line theory) resulted in depreciation averaging 10% a year, and sometimes even more than that.

Other countries, notably Germany prior to the war, established accelerated depreciation policies as a stimulus to plant modernization. Britain has used it successfully. So has Canada. And even our own government did it during the late war when it permitted five-year amortization of new plant-equipment investments.

It is in the national interest to allow a short period of depreciation. To quote Joseph Trecker, executive vice president, Kearney & Trecker Corporation, "This is the road to lowered manufacturing costs and to a higher standard of living.

"The United States Treasury cannot lose in any case. If the expected life is short, it will collect proportionately more taxes in the future. If too long, it collects more taxes in the present."

A free depreciation policy will clear the way for industry to attain the highest possible manufacturing efficiency.



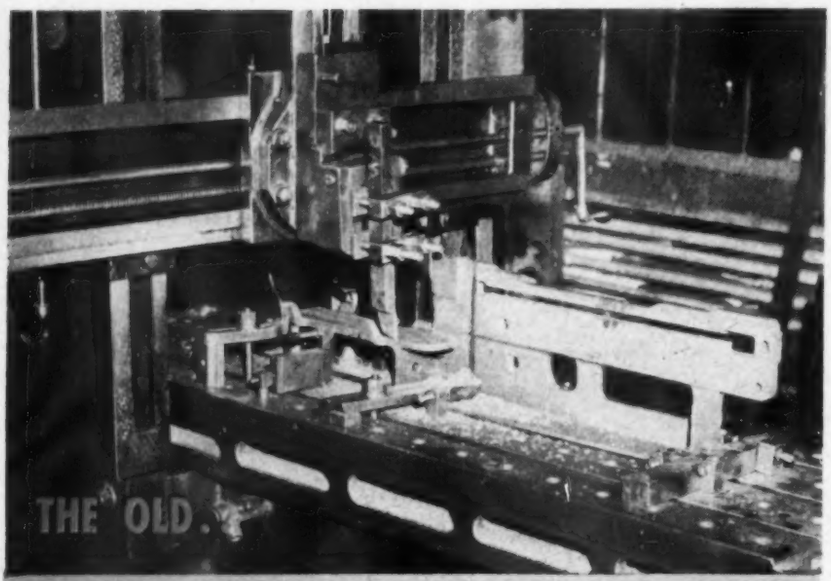
A SPECIAL American Machinist PRE-SHOW REPORT

● *For the first time in twelve years a Machine Tool Show is to be staged—in September in the Dodge-Chicago plant at Chicago. At that time more new productive machine tools will be displayed under one roof than ever before. Knowing that large numbers of its readers, here and abroad, will be at the Show, AMERICAN MACHINIST this issue begins a series of special articles describing new machine-tool developments and modernization policies. These articles will aid readers in appraising in advance the major significance of the Show and its far-reaching effect upon America's industrial life.*

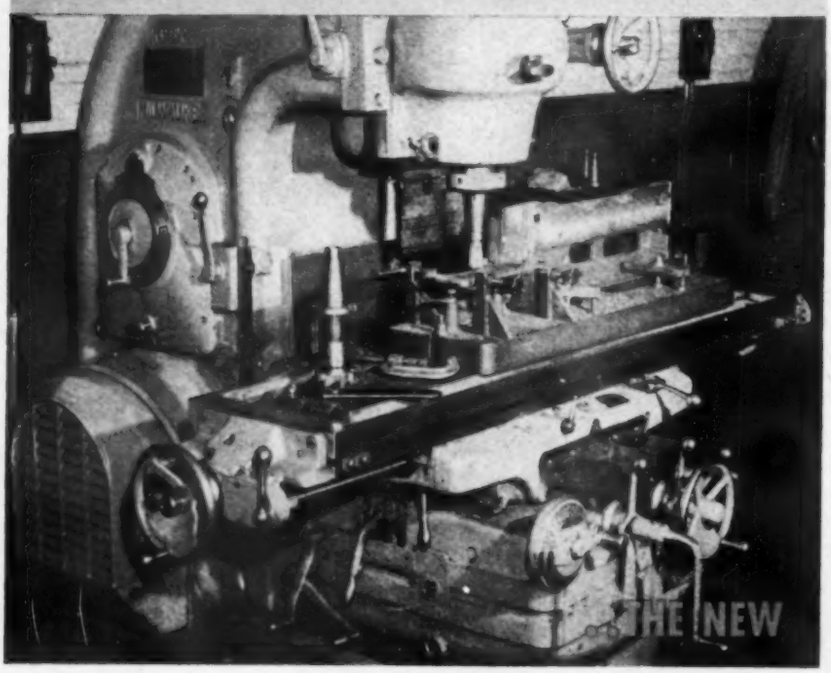
Machinery Replacement Gets Green Light

Direct cost saving is basis for machine-tool replacement policy at Crompton & Knowles, regardless of age of existing equipment. A fresh outlook on an old problem, as explained by O. V. Payne, works manager, to . . .

HAROLD L. FLYNN, ASSOCIATE EDITOR



Replacement of this planer for machining a standard Crompton & Knowles loom casting was suggested when a job analysis and rate study indicated that a 20% direct labor saving could be made if the new machine were used 75% of the time. As a result a vertical milling machine was purchased and met these requirements, although the planer was still in relatively good condition



A MACHINE-TOOL replacement policy which pays in many ways has been put into effect by the Crompton & Knowles Loom Works, Worcester, Mass. Known as the "20-75 Plan," it provides for replacement of an old machine, regardless of its age, if the new machine will produce a cost-saving of 20% while being used 75% of the time.

This policy, adopted in 1946, does not depend on a fixed budget. One of its great merits, in fact, is its flexibility to meet varying economic and labor conditions. It is keyed primarily to technological progress. The management is prepared immediately to take advantage of new machines and processes instead of being compelled to wait because the year's budget holds down capital equipment purchases to a fixed sum.

In addition to its flexibility, the 20-75 Plan is an incentive for ready investment whenever the opportunity offers. It likewise puts into practice plant modernization which so many companies merely talk about without taking any action. And the modernization is on a self-amortization basis. The plan also achieves control of manufacturing cost, an objective toward which manufacturers constantly are striving.

Crompton & Knowles is one of the oldest and best known firms making textile looms. With its 350,000 patterns, 80,000 separate purchased items and 12,000 different parts in process at the same time, it is completely outside the scope of what is commonly thought of as a "mass-production industry." Yet the management recognizes, just as do the mass-production industries, the fact that measures must be taken to see that the price of looms is kept within reason. One of these measures is a sensible and forward-looking machine replacement policy, which is an important element controlling manufacturing costs.

Last year Crompton & Knowles spent over a million dollars for new

machine tools and improved equipment. Though all of the machine tool expenditures did not result from application of the 20-75 Plan, the plan was the most decisive factor influencing replacement, regardless of the age of equipment. Establishment of new manufacturing departments and expansion of existing departments were responsible for some of the purchases.

The 20-75 Plan was not the outcome of an overnight decision. The formula was arrived at after careful study of production and cost figures over a period of years. It was set up because it successfully meets any changing set of conditions and embodies a satisfactory safety margin to offset any faulty job diagnosis.

There is no slavish adherence to the plan. Sometimes machine tools are bought which do not meet the 20-75 requirement. The plan, nevertheless, represents the point at which machine tool purchases will be recommended regardless of the age of the replaced tools and with no chance of veto by top management.

Enlargement of departments, opening of new departments and the sheer wearing out of machines are some of the reasons why the plan does not always apply. In one case, a gear generator 12 years old was supplemented by a second machine, a new one, which showed no startling cost saving compared with the first machine. The flow of work had become too great for one machine alone.

First: Check Savings

Machine tools to be bought under the 20-75 Plan are analyzed first for possible savings by the production superintendent, sometimes acting in conjunction with an engineering representative of the machine-tool builder. The machine requisition and savings analysis then goes to the plant manager and on to the president. If it meets the formula, it is quickly ratified; if not, it is returned for re-investigation.

Machine tools delivered under the plan are listed under their equipment requistion numbers on arrival at the plant. On the same sheet is shown a description of the machine, quantity and plant location. When ready for "monitoring," they are suitably marked.

After machines have been installed and are in production, they are checked in actual performance against the estimated time study and savings report. Some machines admittedly fall short of the estimated savings, but many more show greater savings than anticipated.

Tooling expense is not figured in the savings which determine whether a new machine tool is to be bought. The reason is that all machines at Crompton & Knowles are used on many different jobs and pieces. The

NEW MACHINES PLACED IN OPERATION IN 1946

Equipment Requisition Number	Machine Description	Quan.	Date Rec'd.	Plant Location	Ready for Monitoring	Monitored
CR-71925	Cinn. Heavy-Duty Grinder	1	5/31	Dept. 127	x	
CR-35589	2-hp Bradford Floor Grinder	1	11/18	" 127		
CR-71780	Lepel 80 kw Induction Heater	1	8/8	" 868	x	x
CR-71738	Milwaukee #4 Vertical Mill	3	6/20	" 200	x	x
CR-71668	Gisholt Hydr. Auto Lathe	1	1/2	" 200	x	x
CR-71689	" " " "	1	2/19	" 200	x	x
CR-71720	" " " "	2	2/1	" 200	x	x

MONITOR REPORT

CR-71780 - Lepel 80 KW Converter & Auxiliary Equipment.
For Head & Dobby Mach. Dept. 47 - Parent, Foreman.
Estimated cost $5609.50. Actual $5975.72.
Estimated saving of 20% Direct Labor.
Four part numbers have had new rates established.
The rate on the old machine was 15¢ per hundred.
New rate on the Lepel is $.105 per hundred.
A saving of $.045 per hundred, or 30%.

CR-71738 - 3 Milwaukee #4 Vertical Milling Machines, machine numbers 4587, 4548, 4549. For Milling (200) Dept.
A. Campbell, Foreman.
Estimated Cost $88,867.00. Actual $84,078.88.
New equipment for C. I. Dept. Est. saving 40%.

Time studies are still being made to change from planing to milling.

I have taken five items that have been completely time studied and which have standard practice sheets approved. To the new rate has been added the cost of any operation done on any other than the above machines to make the rates comparable.

	Rate, each		Saving	
	Old	New	$	%
171401 Layend	1.88	$0.6485	$0.6865	51.41
175006 Stand	.28	0.192c	0.0875	31.25
175593 Layend	1.274	0.6055	0.7685	55.98
175604 "	1.724	0.7087	1.0153	58.89
175605 "	1.374	0.6205	0.7485	54.11

CR-71668 - 1 Gisholt Hydr. Auto. Lathe #12 - Mach. #4427
71689 - 1 " " " " #12 - " #4482
71720 - 2 " " " " #12 - " #4477-8

For Turning (200) Dept. - Lucier, Foreman
Estimated cost $30,137.00. Actual $29,928.68.
Estimated saving 30%.

In making this check I went direct to the job and took 20 part numbers from stock boxes going through the department. Ten (10) of these items were still being time-studied and could not be checked.

On the other ten (10) items, it was necessary to combine rates with work done on other machines in order to arrive at stages of completion comparable to the method of handling previously on the old machines.

One of these rates showed an increase of 9%. One item was approximately the same. Eight items showed a decided saving in cost over the old method of manufacture. The rates of saving on these items were:

28%, 41%, 46%, 49%, 59%, 66%, 68%, 69%

Detailed figures are on file from which I have arrived at quoted percentages.

NEW MACHINE TOOLS purchased under the 20-75 Plan (as well as conventionally) are listed in an operations sheet, a segment of which is reprinted here. All machines but the Bradford floor grinder were purchased as replacements and had to be monitored, as indicated. All machines but the Cincinnati H. D. grinder have been monitored. A typical monitor sheet for five of the machines listed is also shown, with estimates of the savings

Replacement on "Useful Service Life"...A Fallacy

Machine-tool depreciation cannot sensibly be based on any theoretical "useful service life," because it disregards profit, competitive status and technological progress. Only a monopoly could profitably remain in business by adherence to "useful service life" as a basis for machine-tool replacement.

"Useful economic life" would much more aptly describe the point at which a machine tool should be replaced for any particular operation. In other words, there is a point in machine-tool improvement and processing technique at which replacement can be made and show an immediate labor saving or cost advantage. This is the time to replace, because it acknowledges the ability to effect a quick write-off and show a growing profit on the investment. Displaced machines can always be downgraded until they do not conflict with progress and practical replacement. This is the C&K plan in action.

tooling cost is borne by the article being made because the amount of tooling is directly related to the number of pieces involved.

Savings arising from the 20-75 Plan cannot be attributed entirely to the new machine tools purchased. They often come from change of processing which necessitates the acquisition of a particular new machine tool. Nevertheless, the machine tool which makes possible the improvement in cost is the machine tool purchased.

In extreme cases, Crompton & Knowles will buy a machine tool which will show a 10% direct cost saving when used 50% of the time. Such purchases must be justified by a number of considerations other than direct cost, such as saving in floor space or improvement in product and finish. These purchases constitute a small percentage of machine-tool replacement; for the company has found that it pays to stick as closely as possible to the formula.

Greater financial responsibility and bookkeeping must reside in the production department under the 20-75 Plan so that some practical anticipation of replacement funds can be relayed to the Treasurer's office. A cash flow statement, covering an anticipated expenditure six to eight months ahead, is an integral function of the production department along with machine-tool requisition and delivery listing and monitor reports.

A close check on operator rates is kept after a machine tool is installed under the 20-75 Plan so that a satisfactory norm of direct cost savings can be established. Variations in rates throughout the machining and finishing departments are closely watched. Should the bonus rates for an operator run consistently high because of machine shutdowns not attributable to him, the job is analyzed. Corrective methods may even include a change in processing and justification of machine-tool replacement under the formula.

Quantities in any one machining job at Crompton & Knowles range from 5 to 500 pieces. In the cast-iron machining department, as many as 70 jobs a day are fed to 80 machine tools. The penalty for obsolescent practice and the benfits of efficient methods in this type of operation are great.

Although Crompton & Knowles operates under a 20-yr. depreciation policy, it is a formality and does not restrict in any way the functioning of the 20-75 Plan. Frank analysis of company operations and profits has done much to point out the fallacy of straight-line depreciation. The management believes that profits derived from a progressive replacement policy should provide a fund, for a flexible continuation of the present policy and that purchases should not be restricted by a slow accumulation of depreciation reserves.

THE NAMES OF THINGS

INACCURATE or loosely used names for parts of machines and for small tools has cost us more dollars than most of us realize. Take lathe tools as a simple example: The tools that cut to the left are called right-handed tools. As nearly every boy in the shop learned it that way, the loss perhaps wasn't much, but the man from Mars—or even Europe—might easily be confused.

Prof. Boston's committee on nomenc*l*ature (accent on the *cla* if you please) solved this very nicely by establishing the rule that we look at a lathe tool from the cutting end instead of from the shank, as formerly, and then we can logically call it a right-hand, or a right-*cut* tool.

Spiral and Helix—Then there is the ever-present conflict between "helix" and "spiral" which is still not settled. In the same catalogs some reamers are called helical, others spiral, the only difference being in the lead of the helix, or the lead angle of the teeth. But a large-angle reamer (like the Gammon type for taper-pin work) is nearly always called helical.

If we just remember that a spiral is in one plane, like a clock or watch spring, there is hardly any excuse for being confused.

About Carbides—Another very common error is the use of the term "cemented carbides." They are not cemented, but *sintered*, so why not call them by their correct name?

Clearance and Relief—Two other terms frequently twisted are "clearance" and "relief." While both are provided to insure free cutting they are really quite different. Relief is the removal of a *small* amount of metal directly behind the cutting edge to present a sharp edge to the work and not have a drag on the work by the metal directly behind this cutting edge.

Clearance is the cutting away of metal back of (or behind) the relief to provide a space for chips so there will be no crowding of chips against the work, or clogging of the space through which chips flow away. This is sometimes called "secondary relief," but "clearance" is now the usually accepted term.

Needed:

HUMAN ENGINEERING

BY E. J. TANGERMAN
MANAGING EDITOR

Intolerance and suspicion, bred of misunderstanding, are current major causes of industrial inefficiency. White-collar men and workers alike must realize that "management" and "labor" are both synonyms for people

As ANNE O'HARE MCCORMICK said recently: "The jangle you hear is not so much national anthems out of tune as clocks out of time. The primeval tom-tom still beats while the atom bomb ticks . . ."

She was speaking on international relations, but her observations might just as well have applied to industrial relations in many plants, where time is just as far out of joint. Too frequently, tomorrow's methods of production are paired with yesterday's ways of handling men.

At the moment, labor's push is strong, so we have wages spiralling up (but not production), and a host of other gains for labor. But labor forgets now, as management did (and will), that the pendulum always swings back, and that the overpush today means a contrary swing tomorrow. It is probable that the current swing against management is at least partially compensating for management's overpush a few years back, and there are those who will argue that swings of the pendulum are as essential in achieving industrial progress as they are in keeping time. We venture to raise a timid voice in disagreement, because neither time nor progress stands still because a clock stops. The clock is a recording device, not a controlling one.

This seems worth thinking about because labor's desperate effort to push the pendulum just a little bit farther is now being countered both by public opinion and by postwar management, and because many management men seem to consider the November election results not only a personal victory but also a mandate to turn the clock back to 1928 or earlier.

Their idea of a "sensible basis" for management-labor relations is just as cockeyed in one direction as the ideas of some labor leaders are in the other. They believe that might-makes-right dictatorship can be re-established, that again the Boss' word will be absolute law, that men and machines are both destined to be the slavish tools of impersonal—even absentee—management.

That possibility is as unlikely as the travel record of the now-famous Kilroy. It is part and parcel of the chip-on-shoulder attitude that characterizes management-labor relations when neither side recognizes the other as human, with human failings as well as human better qualities. Or again, it is as unfair, and as outmoded, as the Double Standard, which pitifully attempts to shield errant males.

Remote control in shop management got its first big boost from Fred Taylor in the early days of the century—only we called it "scientific management" then. Taylor showed us how to analyze the different operations that go to make up a job, but his "absent treatment" idea of having all the brains tied up in the "planning department" did not prove helpful. Taylor had no use for the manager or owner who tried to hog all the gains due to increased production from his system, but he did not know how to get along with men who work with their hands—nor did many of his men.

Misunderstanding inevitably leads to intolerance —on both sides. Present publicity in the press tends to lay all the blame at the door of labor. There's no doubt that there is where a good share of it belongs. But a good share of it belongs also to management, which likewise has been guilty of "getting all the traffic will bear"—in fact, has been given credit for originating the idea. The legendary pot and kettle are calling each other names again—because neither understands the other.

This involved situation will not be resolved by the "brass hats" holding a reception at which they shake the hand of each employee, or even by their abandoning the ivory tower in the realization that their social prestige is less important than smooth functioning of the working force. Management has a sales job to do, more important than selling the product—*it must sell itself to its workers.*

A decided change has occurred in the attitude of labor during these last years. The portal-to-portal controversy exemplified it. Time was when the

workman expected to be on the job, dressed and working, when "the whistle blew." He was, if ambitious, even known to take real pride in the job he was doing, to have a sincere satisfaction in accomplishment.

Now, however, working fewer hours, with more holidays, more mechanical aids, better lighting, air conditioning, medical care, even music and recreation programs—he seems fearful of overdoing—afraid he will be doing too much for his pay.

What is behind this change in attitude? Obviously the workman wearied of paternalism in those cases where it existed, but does he weary as well of fair treatment and consideration? Does the prospect of guaranteed unemployment compensation, pensions or some other factor remove the incentive—and bore him stiff? Has the craft or skill that was the shopman's "social security" been abandoned for the Government-provided variety?

In evaluating the problem as difficulties in understanding between human beings, we must not overlook the fact that neither all workmen nor all executives are intelligent enough to handle their mutual problems equitably. In the case of labor, for example, wage-incentive systems (now enjoyed by a third of all industrial workers) naturally favor the more intelligent man, tending to weed out or discriminate against less-intelligent ones. Obviously, the less-intelligent group resents this.

It seems only fair to assume that what applies to labor applies to management, where training and seniority are more frequently confused with intelligence than they are at labor levels. Men rise to positions of authority and prominence because of repetitive experience, but lack the intelligence to handle any new problem except by slow trial and error. They depend upon someone above them to make pioneering decisions; when they must plan and decide for themselves, they fail. A primary cause of trouble at executive levels is the faulty assumption that children of intelligent parents are automatically intelligent, hence can run a business as well as their fathers. Heredity doesn't govern intelligence, unfortunately.

"He never actually talks back, but he listens in the most insolent manner!"

It is far more important that the executive be intelligent than that his subordinates be. If he isn't, more-intelligent men below are resentful and either slow down or resist while the executive, likewise resentful of "bright boys," tends to cut his own circle of subordinates to his own mental level or below. Intelligent management, like morale, filters from the top down; it isn't built from the bottom up. For smooth plant operation, each man must have confidence in the knowledge and ability of his superior; each superior must have the human understanding to understand and respect his men. Maybe we should have intelligence tests for management, to match the aptitude tests for labor.

Five Case Studies

The human factor is frequently given insufficient consideration when management makes changes for "efficiency." Five examples may show the folly of planning that neglects workers as people:

1. A large plant converted to carbides, but found tool breakage far above that expected. Somebody finally remembered to ask workers about it, discovered that carbides doubled production and physical labor expected of operators—at no increase in pay. Proper materials handling and incentive pay seemed to end tool breakage, for some strange reason.

2. International Business Machines Corporation discovered, several years ago, a girl operator who wanted to set up her own machine—thus defying the planners who had installed setup men so the operator's job was simplified. Thomas J. Watson overruled the engineers, ordered that she and other operators be permitted to try setting up their own machines and inspecting their own work and be paid more if successful. After three years, this "job-enlargement" program is a success, with production maintained, rejects cut sharply, and cost down. Thirty-two setup men and inspectors in the milling department have been shifted to other jobs at the same or better money.

3. A new feed device was applied to machines in one department. Production, instead of rising, fell off. Finally the engineer who had designed the feed went out to talk to operators. One suggested this slight change, another that one. The engineer, somewhat surprised to find that most of the operator suggestions made sense, modified his design. Production zoomed and the feeds became a success overnight. The user had had a chance to express his opinion.

4. One General Motors plant making M-1 carbines had to train green men for precision jobs. The men were taken to the target range and allowed to fire the carbine, saw how the part they made contributed to the smooth functioning of the gun. Back at the plant, instructors helped each man adjust his job to his own rhythm and physique, allowed him

to work out his own schedule and procedure. Production climbed, absenteeism and turnover dropped.

5. Riveters on the night shift making fighter-plane wings were invited to come to the test field one day, allowed to climb all over the planes they helped make, saw them demonstrated. One of them, two days later, was still so pepped up about it he could hardly talk coherently, so proud of "our" fighter he practically popped buttons from his Sunday shirt. He wasn't driving rivets; he was fighting a war—and grinning instead of grousing as he fixed up other men's earlier "bulls."

Trust is Important

There's an old adage: "If you employ a man, trust him; if you can't trust him, don't employ him." The same philosophy applies to giving the worker responsibility and a chance to exercise his judgment. If a man is competent to do an exacting job, he is usually competent also to inspect it, to set it up, to help in planning it. And he also is worthy of trusting with management "secrets" on business prospects, trends and plans that concern his job. All that is required is a little trust, a willingness to replace "I" with "we." Every athletic coach worth his salt knows this trick, as does every rabble rouser. Why can't some executives learn it?

"Machines alone do not give us mass production," said Henry Ford II before the SAE a year ago, "Mass production is achieved by both machines *and* men. And while we have gone a long way toward perfecting our mechanical operations, we have not successfully written into our equation whatever complex factors represents *Man,* the human element."

Steps are now being taken to correct this situation. Enlightened management is studying workers as *men,* not with the old paternalistic (and selfishly patronizing) attitude, but in a sincere effort to understand and appreciate. Here are cases in point:

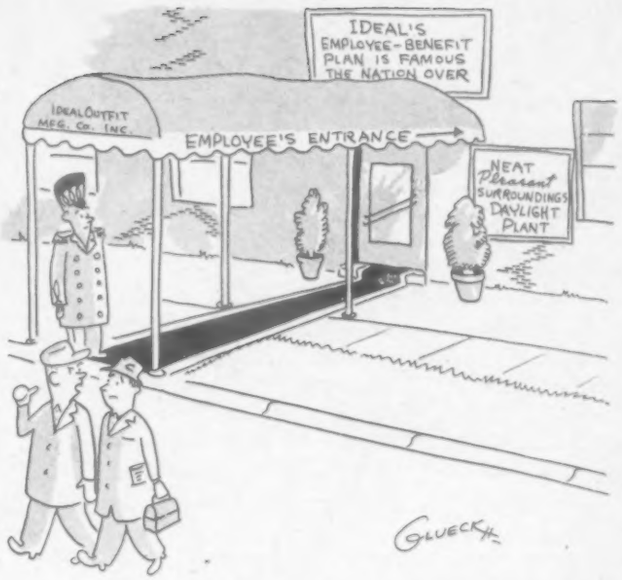
1. Make Foremen Responsible

One large motor-car manufacturer is taking steps to train junior executives to maintain closer contacts with workers. In the past, shop executives arbitrarily hired and fired men on an order to cut personnel sent down from on high.

The new management in this organization has changed that picture completely. Now each department foreman must represent the management. He is given a definite task and budgeted with the expense in labor and overhead his department must carry. His rating as a manager is based on how well he keeps up his production and how well he keeps costs within his budget.

When production was recently cut back because of anticipated shortage of steel, each foreman had the job of trimming his department to suit the new schedule. He, alone, had to decide how many men he could keep. The responsibility lay on the foreman, who should know the personal problems of each man, those that were entitled to stay and those indifferent about their jobs.

Union seniority, of course, makes for indifference.


IDEAL'S EMPLOYEE-BENEFIT PLAN IS FAMOUS THE NATION OVER
IDEAL OUTFIT MFG. CO. INC.
EMPLOYEE'S ENTRANCE
NEAT Pleasant SURROUNDINGS DAYLIGHT PLANT
GLUECK

"Deep down inside they're like any other employers, though—they expect yuh ta work."

The "you-can't-fire-me" attitude has been all too prevalent where the firing came from the ivory tower. This reassignment of responsibility where it belongs is one significant trend. It cuts out alibis. It develops executives because they have to make the decisions and stand or fall on their performance.

2. Promote Exchange of Information

Another significant trend is to broaden supervision's horizons by getting groups of departmental men together on company time. One organization takes two hours every week for this purpose. Members of the purchasing, production, scheduling, time-study and engineering staffs meet with foremen and setup men. The plant superintendent usually takes part. Men study a management problem and plan solutions at one meeting, then try to apply the plan during the week in their departments and report at the next meeting. There they review their problems and get suggestions. It gives them active experience in applying what they have learned.

These meetings have a very important psychological aspect. A specialist, say the motion-study manager who is working with the particular department, gives a talk and examples of how to apply time study. The works manager or the superintendent may be his "straight man" to change the pace and ask provocative questions. The boss is thus on the spot too. If he does not know his stuff, it won't take long for the men to catch on. Therefore, he must *study* to be sure. That improves his managerial ability, for he has to know more than they do about the job.

The specialist not only has to know his subject, but he usually has been doing some studying too. Both the boss and the specialist soon learn from the questions whether they have conveyed their information to foremen so it is understood. The men

"Now there's a lad to keep an eye on—he certainly shows pride in his work."

also want to impress the boss, so they redouble their efforts to get the most out of the discussion and to show they have applied what they have learned.

3. Pitch In and Help

In one small plant employing about 400 people, the president, an old toolmaker, planned a new production line for aluminum pistons with a lot of his ideas incorporated in the tools and operations. Equipment came from many suppliers. When the line was started, it could not maintain the expected accuracy. After they had spent a week trying to get things going and spoiled a lot of castings, the tool setters said it could not be done as planned. They needed several more new machines to hold required limits of 0.0001 in. The boss put on old clothes, rolled up his sleeves and went into the shop. In ten days he had the line doing just what had been planned—he showed his plan would work.

That was a year ago. Today that same line of tools is producing about 10,000 pieces in 16 hrs. Needless to say, his working force, from foremen to operators, respects his ability.

4. Broaden Knowledge

In this plant, the works manager says his company's motion-study department was originally limited to just a few men. However, as a result of this kind of orientation of foremen and job-setters, the company now has a force of "time-study men" numbering over 700. Supervisors don't consider themselves time-study men, but they can evaluate a job intelligently. They know if it is right.

They tell how one foreman wanted to fire an operator because he followed the foreman's every move with his eyes. It did not seem possible that the worker could be doing his best when he was not paying attention to his job. However, the foreman could not make up his mind to fire the man because he produced more work than any other operator on that job. After he had some time-study fundamentals, he understood that an operator doing repetitive work with both hands can do more without using his eyes than he can with them. When the eyes are used, only one hand can be used at a time—the one being directed by the eyes. The most common example of this training in manual independence is found in learning to write on a typewriter by the "touch system." Speed is doubled because the eyes are not used.

5. Don't Try to "Kid" Your Men

During the first world war there was one plant in Dayton that had wonderful personnel relations. The boss had an ivory tower in which he received distinguished guests. It had a gorgeous reception room with mahogany tables and luxurious deep-cushioned leather chairs. The latest trade magazines and daily newspapers were on the table. A pleasant receptionist welcomed the visitors.

The boss's office was at one end of the reception room and toward the factory. It was furnished with a big oak table that carried a blotter and telephone. Around the room were plain oak chairs to accommodate a dozen or more visitors. The boss had a regular swivel chair behind the table. A door opened into the shop. There was clear glass in the door, with "Welcome" stencilled on the shop side. When he was not engaged with some visitor, it was a standing practice that anyone in the shop could come in with dirty shop clothes and feel at ease. The privilege was rarely abused and complaints cleared up very quickly or suggested improvements made. No shop troubles there.

6. Be Honest and Human

George T. Christopher, president of Packard, has worked up to his present position with both his hands and head. His office reflects his shop background with the pictures of the engines he has built. He talks the language of both the shop and top management. He keeps in close touch with workers. It is said that his door is never closed to any worker who has a problem to discuss. Every week finds him on the bowling alley with the "gang," rolling an average of about 170, which is pretty good competition.

He never pulls any punches and you don't get double talk when you ask questions. His favorite saying is, "The person who tells the truth never has to remember what he has said." He is a tough manager, but seems to have the respect of labor in his big plant. The men know he has worked in the shop himself.

7. Explain Your Expectations

One method used by many smaller plants to make sure that the new men who come to work understand what is expected by the company, is to explain what is expected in advance. One company gives

each new employee a small pocket-size booklet, called "Your Job." On the cover it says "A good place to work with good people." The personnel manager sees that each probationary worker gets a copy. The book covers in simple, direct language: History, Employment, Attendance, Wages, Vacations, Personnel Policies, Office and Shop Rules, Health, Safety and Insurance, and finally It's Up to You. Before a man can become a permanent employee he must sign this acknowledgment slip on the back page, "I have carefully read the rules and regulations, and fully understand them, agree to observe them and know that any infraction may result in disciplinary action." Both foreman and personnel manager make sure that the new worker *has read* and *understands* the booklet. Screening prospective workers and instructing them in this way has maintained the quality of the personnel, while assuring men of understanding and "know-how" management.

8. Teach Cooperation

One shop was having a lot of trouble in getting parts to fit properly when they reached assembly. The management changed the limits on the drawings and still had trouble. Finally they "knocked off" work an hour earlier in the manufacturing department one day and took the workers over to the assembly line. They introduced each worker to the ones who used the parts. In less than a week, they were having no further trouble in the assembly. It became not a routine matter to Joe of getting out so many parts an hour, but a personal obligation to make the piece that Jack in assembly could use. Further, the understanding of how the part was used focused attention on the most critical dimensions much more than the cold figures on the print.

These are examples of the attention progressive management is giving to the human factor, trying to build-on-the-job satisfaction. They're trying to design shop methods that limit human error without stifling initiative, to attain mass production without obliterating personal accomplishment, to retain the advantages of specialization without closing the vista of advancement, to build in each man a sense of his own responsibility and essentiality in the product. In short, they're trying to keep men from hating the jobs that give them livelihood.

There are many indications that labor appreciates this attitude and is attempting to understand enlightened management's problems. A spectacular one was the pledge of the Watch Worker's Union after wage increases last fall, followed by the circular letter of Walter Cenerazzo, president of the union, to the members. It has been extensively reprinted. He summed up flatly: "We've got to help our employers make good profits." Evidently the Golden Rule still holds: "Do unto others as you would have them do unto you"—to which management had better add—*but do it first.*"

TIPS for Top Shop Men

181 Foolishness is so common a trait that a man can be a business success just because he's less foolish than his fellows. So check every decision.

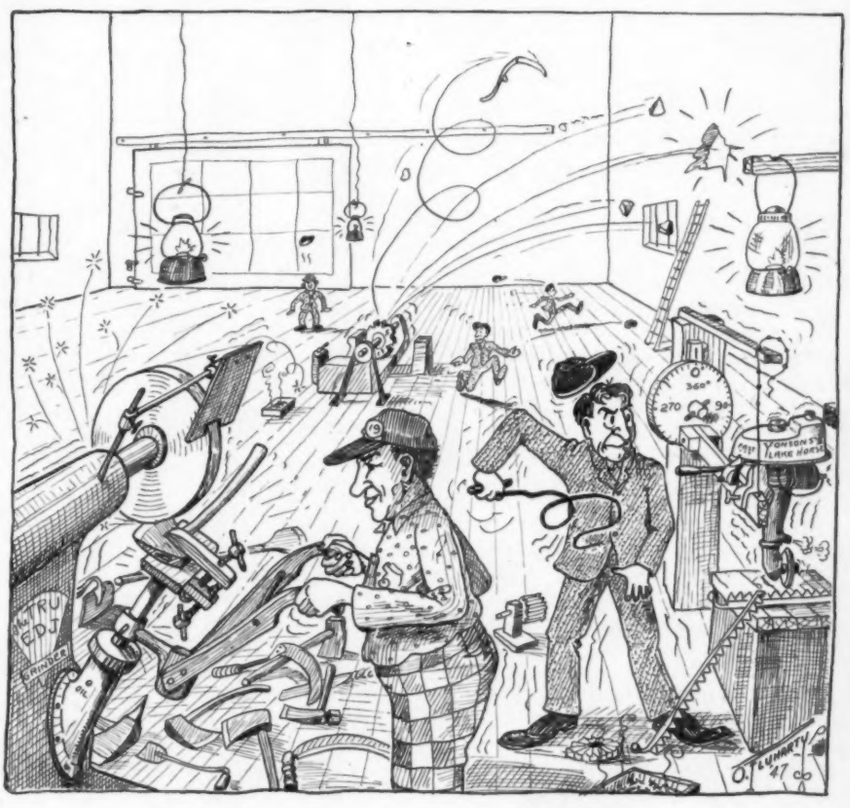
182 A machinist's mistake usually costs a few dollars, a foreman's ten times that amount, a superintendent's ten times as much again. The man who goes up the line, therefore, is frequently the man who makes fewest mistakes.

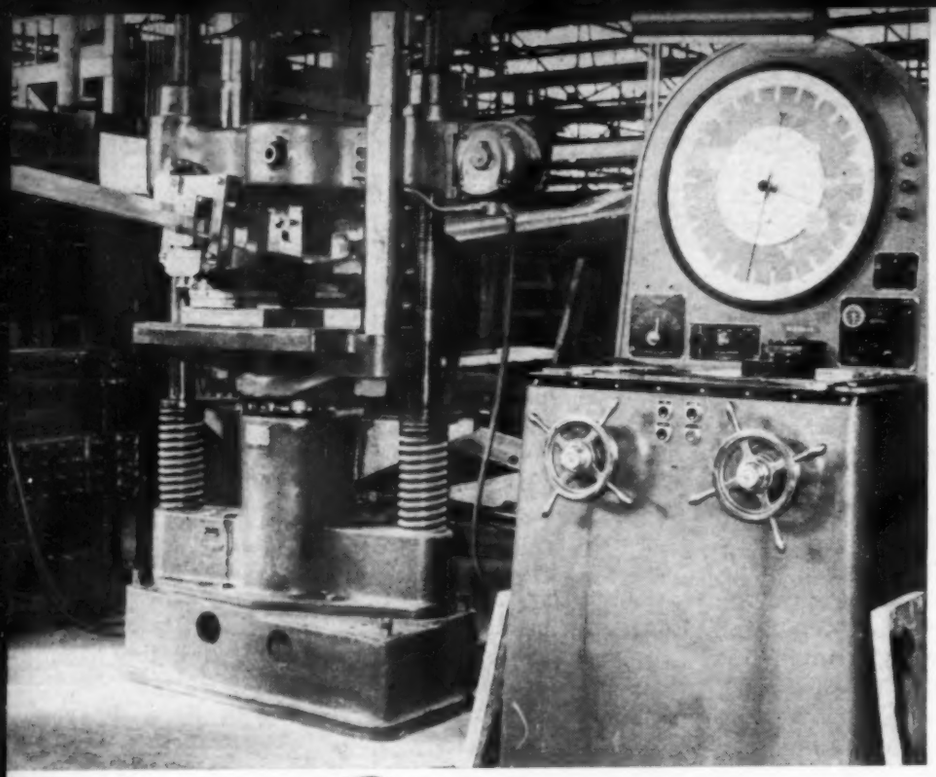
183 Theory is wonderful stuff, but is at times at variance with fact. Usually theory is wrong—but not always. Don't hold to either blindly.

184 Milk is a wonderful body builder, the milk of human kindness a wonderful morale builder.

185 Be smart in what you do, simple in what you say—not the other way around.

OUR SHOP...24 — *Precision Tool Grinding*

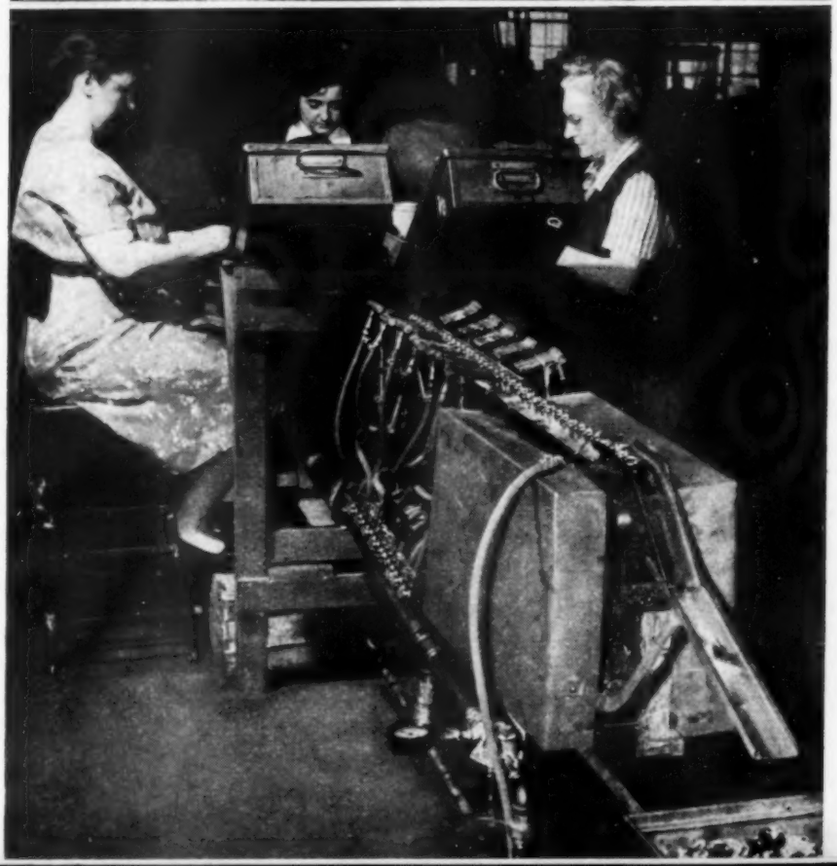




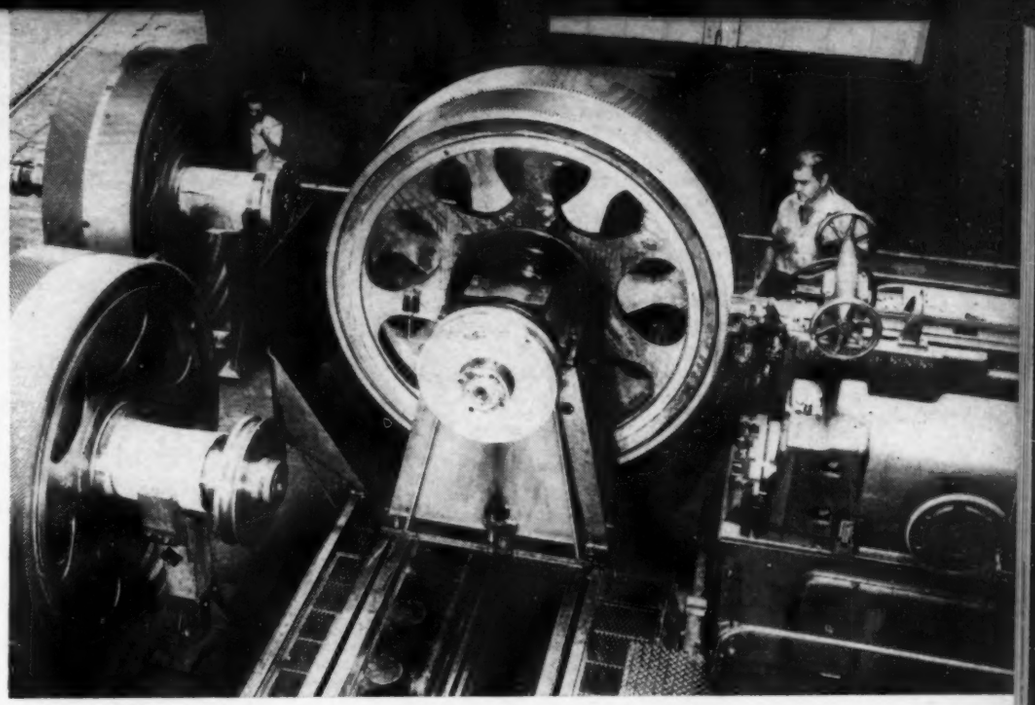
Resistance Heating Cuts Bending Resistance—Severe bends in thick cross-sections of 75ST aluminum can be made best by taking advantage of immediate heat-treating. This spar cap, of 7-in. cross-section, was successfully bent by mounting conductor clamps on it and running current between them to bring the metal temperature up to 300 F. and making the bend in a hydraulic press in this transient stage. Kirksite metal rocker blocks are installed on the spar cap and seated on greased, hardened steel plates so they may slide outward under bending pressure. A steel punch is contoured to the spar cap and insulated from it. *P. F. Girard, Ryan Aeronautical Company.*

SHOP SHOTS

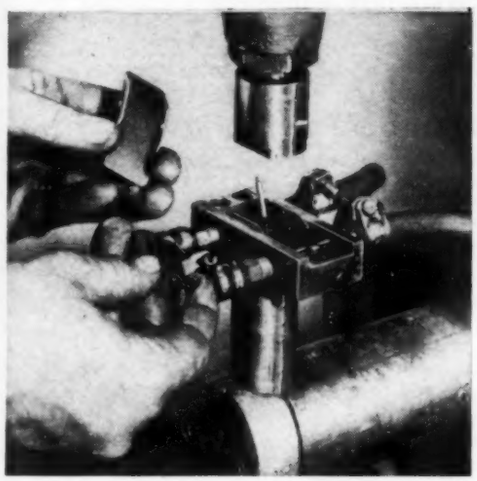
FROM
RYAN AERONAUTICAL CO.
TELECHRON, INC.
WESTINGHOUSE ELECTRIC CORP.
PROGRESSIVE WELDER CO.
LINCOLN ELECTRIC CO.

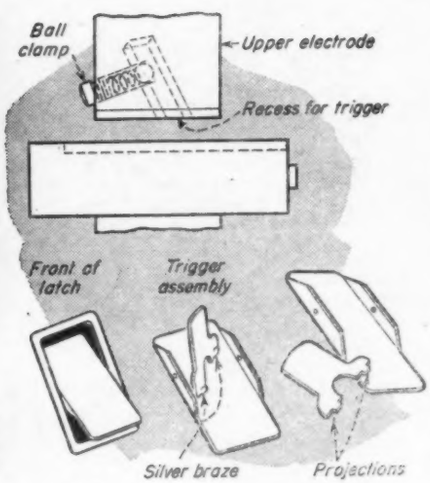


Conveyorized Soldering—Materials handling has facilitated the assembly of watch components by soldering. Spindles are placed in this plate and solder rings preplaced by two women, then fed down two chutes to a third who slips the assembly on a rotating spiked belt. This belt carries the assemblies past the heating torches at a predetermined speed. Even heating obtained prevents any distortion in the twenty assemblies which are passing the flame at all times. After the soldered assembly has passed the last flame, it rides the belt before being discharged down the chute to obtain complete cooling. *Telechron, Inc.*

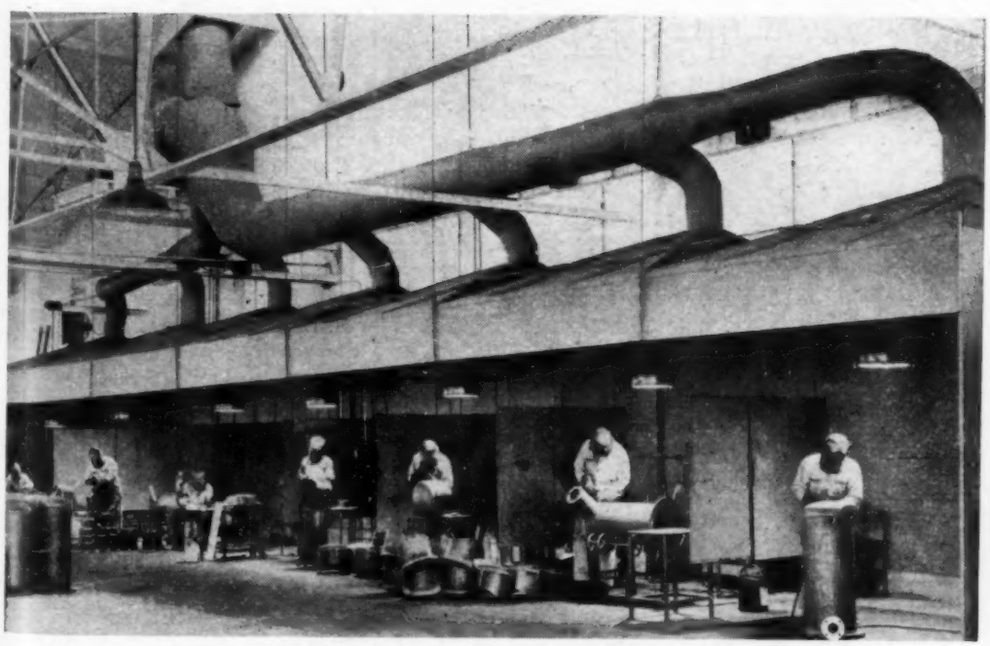


Shaving the Big Ones Too—Gear shaving provides a better finish for small gears, but engineers at the South Philadelphia Steam Turbine Division have found that it also works on big gears, some 8 ft. in diameter. Application of gear shaving to these large gears has enabled hobbing speeds and feeds to be increased by about 50%. Although the surface is somewhat rougher, the subsequent shaving operation gives a finer surface than the best hobbed surface at slow hobbing speeds. *Westinghouse Electric Corporation.*

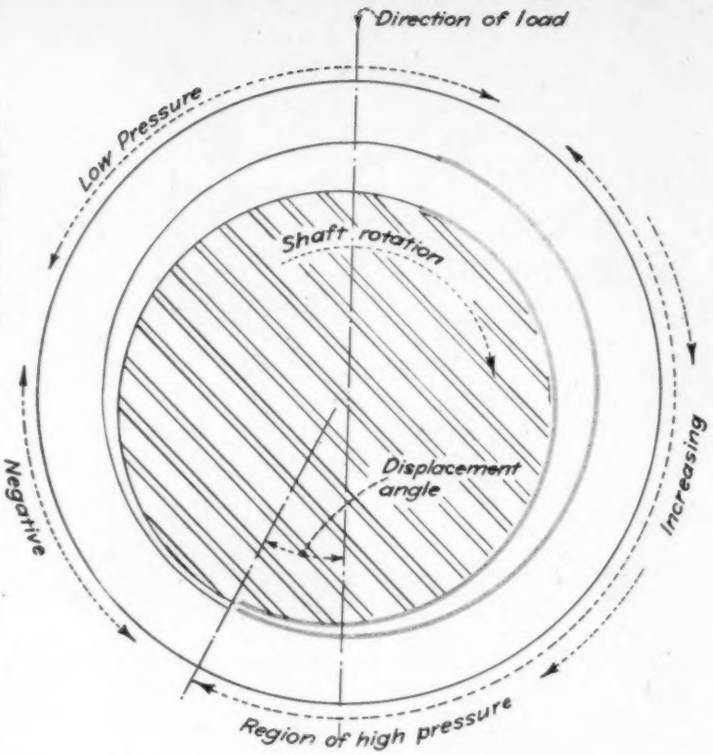




Fixtures Permit Welding—Assembly of kitchen latches at Dedoes, Berkley, Mich., was facilitated by projection welding and a simple holding fixture. Original design of the latch called for the stamped trigger cam to be attached to the formed plate at an acute compound angle by silver brazing. By adding two projections to the design, assembly was made cheaper and faster by projection welding. The upper die holds the trigger cam by automatic spring-clamping and the lower die has a plain recess for locating the trigger plate. This permits straight-line retraction of the welded assembly by the upper die, eliminating the need for special collapsing dies. *Progressive Welder Company.*



Better Booth, Better Weld—Welding operations may be carried out more efficiently and under better working conditions by designing welding booths carefully. At the Erie Meter Systems, Inc., plant, each booth has an individual exhaust outlet, operated and regulated so it may be turned off as desired. Each booth has a large light directed on the work so the operator can see the outlines of the work even though his shield is down. *The Lincoln Electric Company.*



DEVELOPMENT OF OIL-FILM PRESSURE—A shaft operating successfully in a plain bearing is supported upon an oil film containing sufficient pressure to equalize that of the imposed load and generated by the resistance offered by the oil to its passage through the narrowed clearance opposite the point of application of the load. Colored lines indicate decreasing clearance dimension which increases oil-film pressure. Pressure is thus automatically adjusted within the film to compensate for change in load. Note displacement of shaft position from sidewise effect of oil pressure and negative pressure where film thickness begins to increase again

SMOOTH SURFACES Increase Plain-Bearing Capacity

BY E. L. HEMINGWAY, RESEARCH ENGINEER, GISHOLT MACHINE COMPANY

Tests with recording wattmeter show smooth surfaces will carry heavier loads, run cooler, can be fitted to closer tolerances, and suffer much less wear

THEORETICALLY, there is no limit to the load which can be imposed on a plain bearing, because, as load increases, the shaft rotates more and more closely to the bore surface, increasing oil-film pressure correspondingly (above). This theory, however, supposes surfaces to be perfect as far as smoothness and geometry are concerned. It seems appropriate to use the length of an oil molecule (one ten-millionth inch) as a unit of measurement of such perfection. Obviously, commercial surfaces do not even remotely approach that kind of accuracy. The ridge on the average ground surface, for example, is 1000 to 2000 times as high as the length of an oil molecule. Such promontories penetrate the oil film and limit the dimension to which the shaft can approach the bearing bore, thus also reduce the possibilities for high oil-film pressures. Rough and wavy surfaces definitely limit the amount of load a given plain bearing can carry.

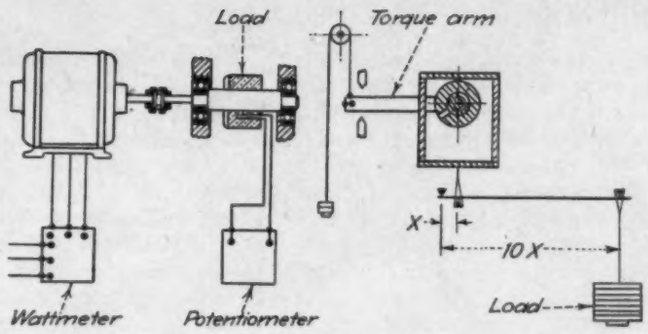
Roughness also limits the load because it results in more rapid bearing wear. Successful "wearing-in" of a plain bearing simply consists of sufficiently mild wearing-away of promontories so a smoothed and practically perfect conformation of the two surfaces is reached. In the absence of foreign grit, it is now generally believed that wear and scoring arise from welding of contacting high spots on mating surfaces. Continued motion breaks these welds apart, tearing out bits of metal from one surface to become ragged projections on the other. Wear thus proceeds both by removal of these bits of metal and by their subsequent scoring and abrading actions.

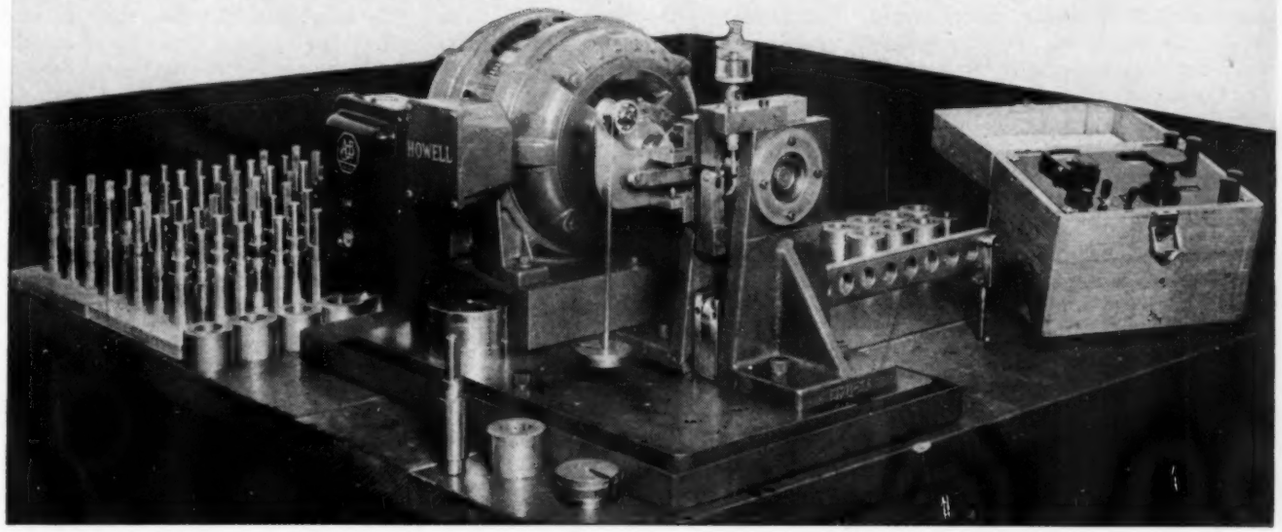
Coarse ridges, of uneven height, lead to welding of sufficient size to cause visible scoring, because such points of contact are few and subjected to exceedingly high pressures. There is considerable evidence that a shaft ground to greater roughness than 10 microinches rms. is very susceptible to such destructive action. Successful wearing-in, then, depends upon restriction of these welds to a very small or "critical" size, in which case greater smoothness than the original is often generated.

This restriction is most certainly accomplished by the use of hardened shafts and of smooth finishes. A hard, brittle surface will not deform by rubbing pressure over large areas of contact, nor will the torn-away particles have appreciable depth. A soft, ductile shaft surface will suffer from larger areas of welding, and the particles will be torn out to considerable depth. Smoothness may actually be increased by wear if, instead of a few welds upon coarse ridges, they are increased in number, but decreased in size, by increasing the number of ridges through finer finish.

Success will also depend upon the degree of waviness present, because this condition not only localizes pres-

BEARING TEST MACHINE—The test shaft, motor-driven through a special universal joint, is carried on two ball bearings mounted in brackets. A bronze bushing 2 in. O.D., 1 in. I.D., and 1 in. long, thus has projected area of 1 sq. in. Load is applied through a yoke hung over a hardened-steel segment on top of the bushing. A linkage connects the yoke to a 10-1 lever, upon the end of which weights are hung. All movable joints are knife edges to avoid frictional errors. A light lever, screwed to one bushing face, alone keeps the bushing from rotating with the shaft. It is normally positioned midway between two stops 1/4 in. apart by compensating for the frictional drag with weights





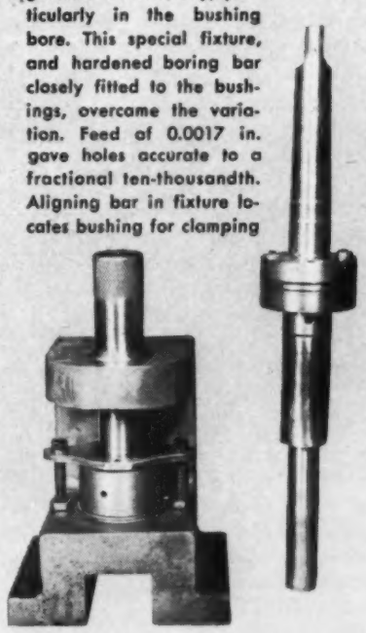
sure, but also determines the amount of metal that must be worn away to achieve the required conformation. The fineness of the original scratch pattern largely governs the initial size of welding; but, if the depth of metal to be worn away is excessive, all control over the size of the individual weld will soon be lost.

Both load-carrying capacity and life of the bearing thus are sacrificed by use of rough and wavy surfaces. While it seemed safe enough to believe these conclusions to be well beyond the theoretical stage, it was my desire to verify them as far as plain bearings were concerned. Accordingly, a test machine was constructed (above).

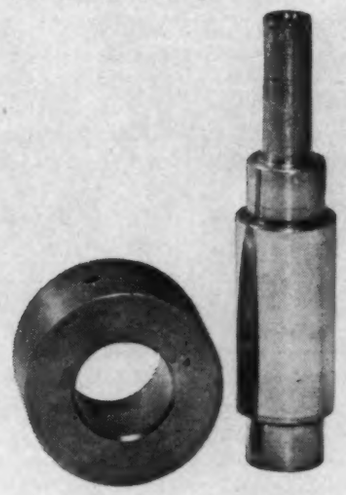
It was soon found that the underside of the yoke, where it rests upon the hardened segment, had to have the radius of the distance from that point where it was attached to the weight lever accurately lapped, or the yoke would seek a position at one end or the center.

We intended to employ the counterbalancing of the lever attached to the bushing as an indication of the amount of friction developed, but we found a sensitive recording watt-

BORING FIXTURE FOR BUSHINGS — Inconsistent results in initial tests were found to be caused by lack of sufficient dimensional or geometrical accuracy, particularly in the bushing bore. This special fixture, and hardened boring bar closely fitted to the bushings, overcame the variation. Feed of 0.0017 in. gave holes accurate to a fractional ten-thousandth. Aligning bar in fixture locates bushing for clamping



TYPICAL TEST SHAFT AND BUSHING — 100 such assemblies were tested at 1750-rpm. shaft speed. Variations in results, which have been the bane of practically all plain-bearing tests, were overcome by special boring of bushings, left, and similar attention to shaft accuracy

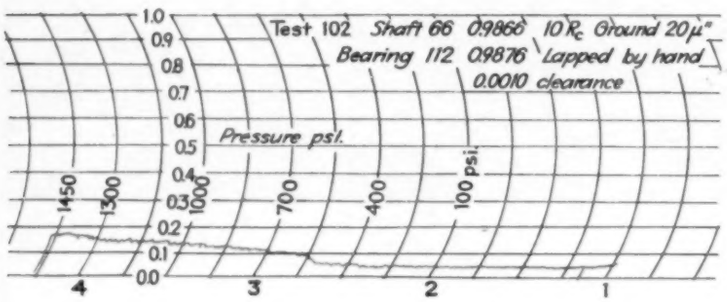


meter in the driving-motor circuit much more satisfactory, especially because it gave a permanent record of variations in torque. However, the lever was discovered to give a very illuminating picture of what was happening to the bearing surfaces. Every minute metallic contact that occurred caused this sensitive lever to "bob" down and up. If a somewhat more serious weld would occur, the lever would remain down for an appreciable length of time; and if a really severe weld occurred, the lever would remain down for several seconds. The severity of bobbing was found to be closely correlated with the amount of temperature rise, checked by a fine thermocouple inserted in a hole in the bushing very close to the actual bearing surface. Temperature readings were taken on a Leeds & Northrup potentiometer.

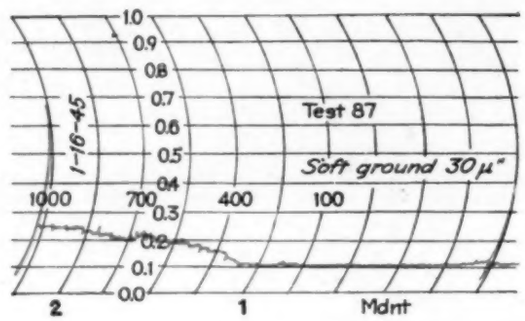
Bronze was selected as the bushing metal, because it is a widely known material, having considerable sensitivity to surface finish and shaft hardness. The analysis was 80% copper, 10% tin, and 10% lead. Two hardnesses of steel were employed, Rockwell C 10 and 62. Lubrication was a metered drip feed, in an excess quantity, of oil of 150 SUS. viscosity. Each test was repeated on three additional shafts, or in sets of four. The shaft was operated for one hour under a tare load of 50 lb., to give it some degree of break-in, after which 50 lb. additional was applied every 5 min. Temperature was noted at the same time, and the test continued until seizure stopped the motor.

Approximately 100 bearing assemblies were tested at a shaft speed of 1750 rpm. It was found that ground surfaces are very unreliable above 10 or 12 microinches rms. For example, at 30 microinches, failure occurred at an average load of 300 lb. Soft shafts ground to 9 microinches failed at 975 lb. and the same shafts Superfinished to 2 to 3 microinches failed at an average of 1637.5 lb. Hardened shafts at 9 microinches failed at 1625 lb. and Superfinished to 2 to 3 microinches at 2725 lb. avg. Peculiarly, yet perhaps as should be expected, the percentage of increase in capacity by smoothing the surface was almost exactly the same with hard shafts as with soft ones. The hard Superfinished shaft carried 67.7% more load than the 9-microinch grind; and the soft Superfinished 67.9% more. At comparatively high speed, smoothness thus has a very definite effect on load-carrying capacity.

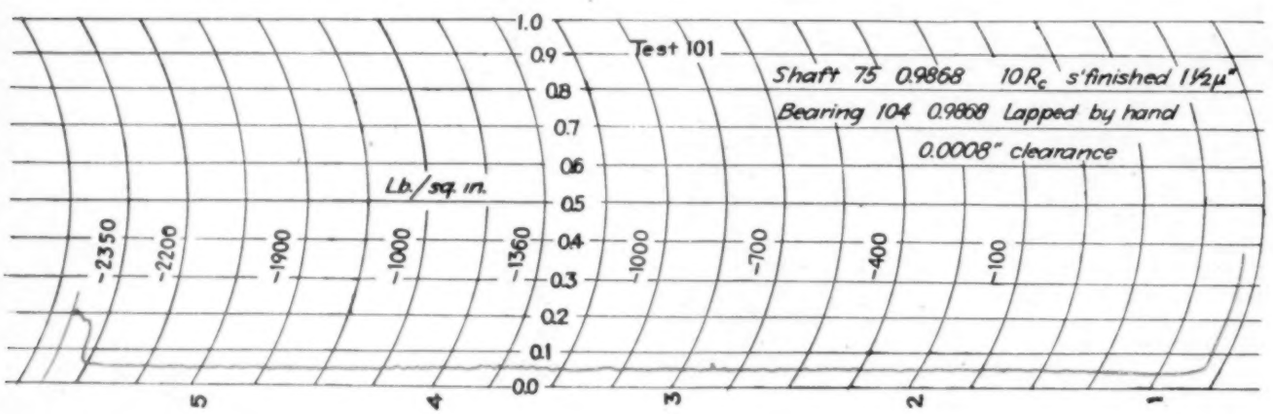
At high speeds, high oil-film pressures are possible, and fairly complete separation of the two metal surfaces is comparatively common



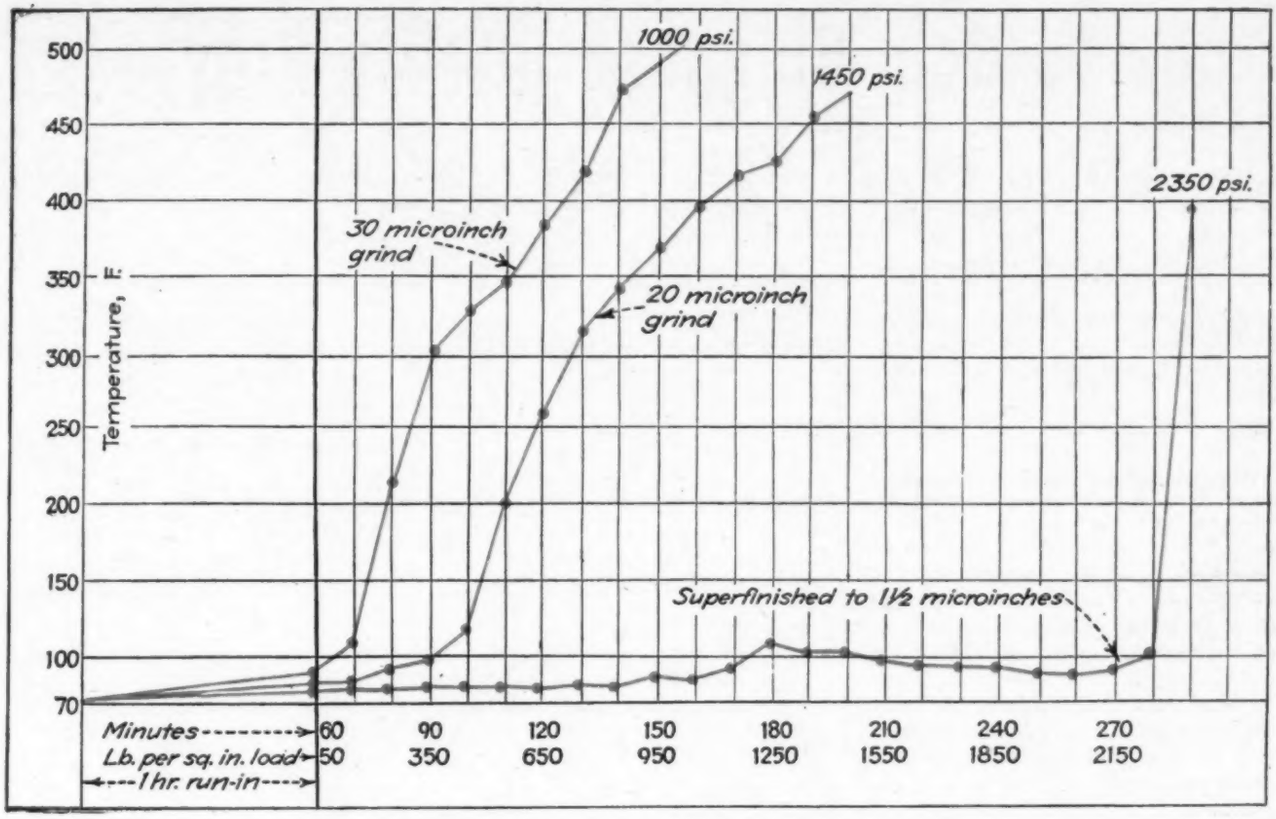
TEST OF SHAFT GROUND TO 20 MICROINCHES RMS.—This wattmeter chart shows the shaft operated fairly well for the 1-hr. break-in period (far right), but began to show contact and welding immediately after first additional load was applied. Each welding action, even its severity, is faithfully recorded by angles in the charted line. Roughness of 20 microinches, about average "good-quality" grinding, readily penetrated the oil film. While the bearing operated up to 1450 psi., serious damage began (at 450 psi) soon after the first addition of weight. Welds were well above "critical" size, which in operation would ruin the bearing in a few hours



TEST OF SHAFT GROUND TO 30 MICROINCHES RMS.—This wattmeter chart shows results similar to those of the 20-microinch, but failure occurred at 1000 psi. instead of 1450, and rise in wattage was more rapid, as would be expected from the greater roughness. Scoring started immediately (at 150 psi.) upon first addition of load, and this quality of surface has no commercial value whatever



TEST OF SHAFT SUPERFINISHED TO 1½ MICROINCHES RMS.—This wattmeter chart shows practically perfect performance and the tremendous difference in operation made possible by smooth finish. Seizure load capacity o fthe 1½-micron surface is 62% higher than the 20-micron and 135% higher than the 30-micron. Only between the 1000- and 1500-psi. loads did any perceptible welding occur, and that was below the "critical" size, because smooth performance was again in effect before failure at 2350 psi. Damage began at 2250 psi., so this surface safely carried 15 times the load carried by the 30-microinch ground surface, and 5 times the load carried by the 20-microinch surface



TEMPERATURES DURING TESTS—Increase in temperature results almost entirely from work done in making and breaking welds, and has exactly the same trend as the increase in wattage. On the ground surfaces, generation of excessive heat immediately followed first application of load, but the Superfinished shaft remained cool until just a few minutes before seizure. Temperature of the Superfinished test rose 20° during the slight welding, then lowered in exact agreement with the wattmeter chart

under light loading. Yet when heavy loading has forced the shaft into contact with the bushing, frequency of welding is so rapid that heat seizure is almost instantaneous.

It appeared that still more could be learned from slow-speed operation, because the test could be continued under a much greater degree of metallic contact. Thus a speed reducer was introduced between motor and test machine, bringing shaft speed down to 200 rpm. At the same time, the wattmeter was introduced into the motor circuit.

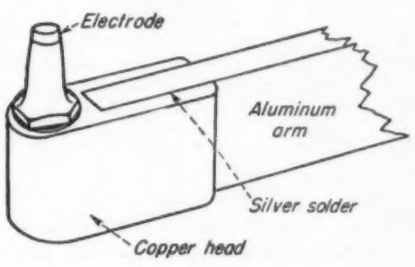
At the slow speed of 200 rpm., the bearing was found even more sensitive to surface finish than at high speeds. While fairly high seizure loads were recorded, results must be analyzed with caution. Serious metallic contact occurred, where any roughness of shaft existed, at much lower loading than at high speed; but, because of the lower speed of rubbing in that contact, heat did not cause seizure as suddenly. Nevertheless, serious wearing and scoring were progressing almost from first application of load, and the bearing would be ruined if operated at far less than the seizure load for any length of time.

In these charts, the large difference in the operating characteristics of ground and smooth surfaces is clearly illustrated. The charts shown were produced by the recording wattmeter in the driving-motor circuit during the testing of one shaft ground to 30 microinches, one ground to 20 microinches, and one Superfinished to 1½ microinches. Theoretically, the friction (and therefore the power required to drive the shaft) should be independent of the load, because the shaft is supposed to be entirely supported by the oil film (diagram). However, at 200 rpm., but comparatively little film pressure is generated and the position of the rotating shaft is very close to the bore surface. Any appreciable inaccuracy in geometry or roughness of surface will easily penetrate so thin an oil film, and theoretical conditions are not then in effect. Metallic contact will increase friction, which will be reflected on the wattmeter chart.

Tests charted on these pages are typical of results that show geometrically improved, truly smooth surfaces will carry heavier loads, run much cooler, can be fitted to closer clearances, and will suffer much less wear. The "wearing-in" process is thus almost complete before first operation of the bearing.

Aluminum Soldered to Copper

To REDUCE the weight of a scissor-type welder, Progressive Welder Co., Detroit, has been making it from aluminum-alloy castings, which also provided greater arm flexibility. Units have water-cooled tips mounted in copper heads. Attaching the copper head to the aluminum arm was a problem until someone suggested silver soldering, as sketched.



Charts Help Diagnose Quality Progress

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HEAD OF FACTORY ENGINEERING, CATHODE RAY TUBE DIV.
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Control charts do not control quality, but may indicate need and effectiveness of action by engineering and production

CONTROL charts have been discussed so much that some people have come to regard them as a sort of "cure-all" or elixir of life for industrial operations. It is well, then, to consider the function of the control chart prior to any further discussion of this exceptionally versatile and useful tool.

The control chart is merely a continuous graphical record of variations during a period of observations, made for the purpose of relating the computations made about the observations (or an individual observed sample) to calculated or assigned statistical means and limits.

Unquestionably, in addition to the advantages listed below, there are others to be obtained from proper use of control-chart systems in industrial quality engineering, but these do not change the nature of the chart itself. Some of the more important advantages are:

1. Fraction defective is reduced.
2. Trends are detected early in their formation.
3. Tolerances and specifications can be set on a realistic basis.
4. The consumer's risk in purchasing is reduced.

Two main uses of the control chart are (a) to determine whether a state of control exists and (b) if control does not exist, to supply a continuous measure of the efficacy of engineering changes and in that way assist in reattaining control.

An interesting use of the control chart as applied to problems of employee bonus is given by A. S. Wharton[1]. Its basic idea is to reward and penalize on the basis of samples passing or failing to pass certain statistical limits. We point this out merely to emphasize the versatility of the chart as an industrial tool.

As a general practice, the control chart is prepared and maintained by an inspector of the quality-engineering section. However desirable this practice may be, the chart could also be kept by the foreman, operator or a clerk assigned to the task.

Sampling is done on a logical basis from a production point of view. Measurements are customarily made at an inspection station, and records kept in a suitable folder. It is a good practice to have a duplicate chart at the production point which the chart is intended to police.

What Is Controlled?

Industrial controls may be considered as consisting of two main types, process controls and product controls, as one is attempting to control a process, product or both.

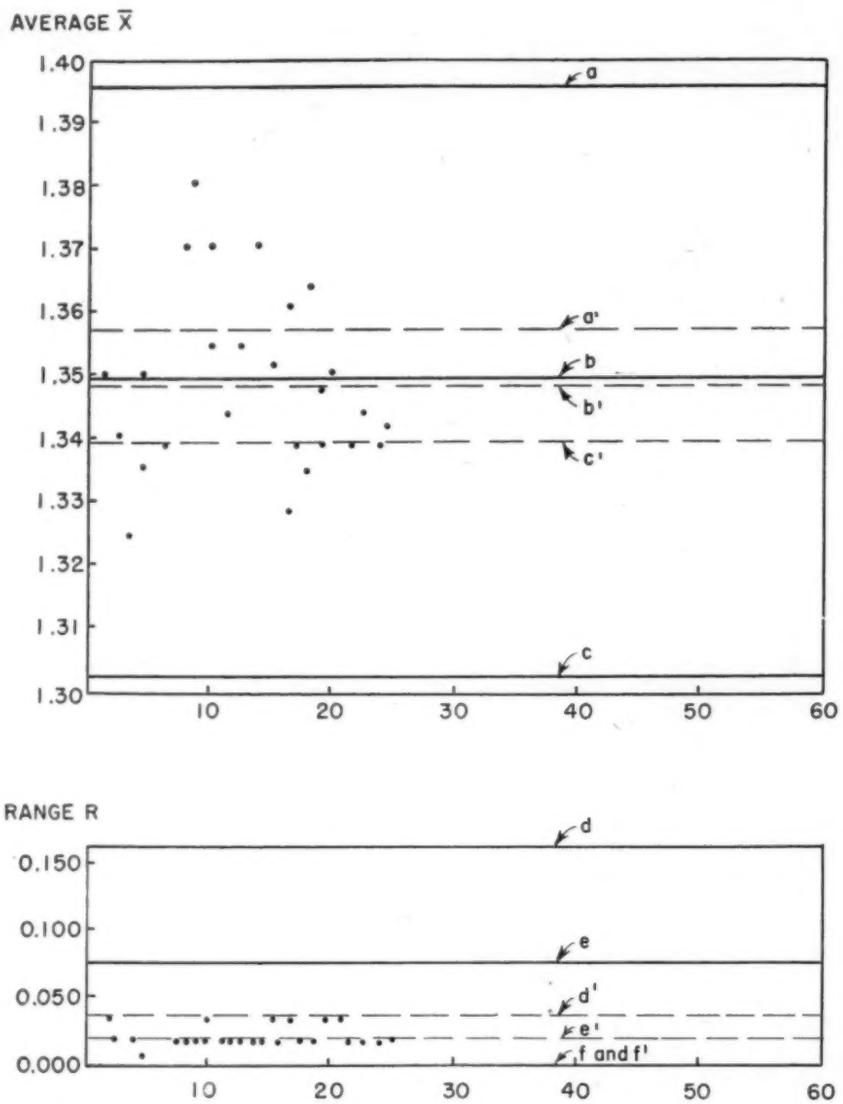


Fig. 1—Average and range charts show averages and control limits for wire resistances. Letters *a*, *b*, *c*, *d*, *e* and *f* are values for standards $X' = 1.35$ and $\sigma' = 0.035$. Prime letters are values calculated by assuming no standards exist

TABLE I — CONTROL LIMITS

STATISTIC STANDARDS EXIST FOR	CENTRAL LINE	VALUES USING FACTORS IN TABLE 2	EQUATION	CONDITIONS
Average $\overline{X}$	$\overline{X}'$		$\overline{X}' \pm 3\frac{\sigma'}{\sqrt{n}}$	$n = K > 25$ (K - constant)
Average $\overline{X}$	$\overline{X}'$	$\overline{X}' \pm A\overline{\sigma}'$	$\overline{X}' \pm 3\frac{\sigma'}{\sqrt{n}}$	$n = K \leq 25$
Standard deviation σ	σ'		$\sigma' \pm 3\frac{\sigma'}{\sqrt{2n}}$	$n = K > 25$
Standard deviation σ	$C_2\,\sigma'$	$B_1\,\sigma'$ and $B_2\,\sigma'$	$C_2\,\sigma' \pm 3\frac{\sigma'}{\sqrt{2n}}$	$n = K \leq 25$
Range R	$d_2\,\sigma'$	$D_1\,\sigma'$ and $D_2\,\sigma'$	$d_2\,\sigma' \pm 3\sigma_R$	$n = K \leq 15$
Fraction defective p	p'		$p' \pm 3\sqrt{\frac{p'(1-p')}{n}}$	$1 \leq p' \leq \infty$
Number of defects pn	$p'n$		$p'n \pm 3\sqrt{p'n(1-p')}$	$0.05 < p'$
Number of defects pn	$p'n$		$p'n \pm 3\sqrt{p'n}$	$0.05 \geq p'$
NO STANDARDS EXIST FOR				
Average $\overline{X}$	$\overline{\overline{X}}$	$\overline{\overline{X}} \pm A\overline{\sigma}$	$\overline{\overline{X}} \pm 3\frac{\overline{\sigma}}{C_2\sqrt{n}}$	$n = K \leq 25$
Standard deviations σ	$\overline{\sigma}$	$B_3\,\overline{\sigma}$ and $B_4\,\overline{\sigma}$	$\overline{\sigma} \pm 3\frac{\overline{\sigma}}{C_2\sqrt{2n}}$	$n = K \leq 25$
Average $\overline{X}$	$\overline{\overline{X}}$	$\overline{\overline{X}} \pm A_2\,\overline{R}$	$\overline{\overline{X}} \pm 3\frac{\overline{R}}{d_2\sqrt{n}}$	$n = K \leq 10$ to be used together
Range R	$\overline{R}$	$D_3\,\overline{R}$ and $D_4\,\overline{R}$	$\overline{R} \pm 3\sigma_R$	
Fraction defective p	$\overline{p}$		$\overline{p} \pm 3\sqrt{\frac{\overline{p}(1-\overline{p})}{\overline{n}}}$	$\overline{n}$ = average sample size, samples approx. equal.*
Fraction defective p	$\overline{p}$		$\overline{p} \pm 3\sqrt{\frac{\overline{p}(1-\overline{p})}{n}}$	$n = K$
Number of defects pn	$\overline{pn}$		$\overline{pn} \pm 3\sqrt{\overline{pn}(1-p)}$	$0.05 \leq \overline{p}$ $(n = K)$
Number of defects pn	$\overline{pn}$		$\overline{pn} \pm 3\sqrt{\overline{pn}}$	$0.05 > \overline{p}$ $(n = K)$

In the above listing $\overline{X}'$, p' and σ' represent standard values set up as industrial objectives. If such standards exist, computed values will indicate whether the observed values of $\overline{X}$, p and σ differ enough from standards to result from an assignable cause.

*If samples differ so the largest is more than 80% greater than the smallest, separate limits should be computed, in using this equation, for each value of n.

In the final analysis, the object of a process control is to assure that the product being made during the process is satisfactory. Consequently, where process controls exist, product controls are often unnecessary and only acceptance sampling tests are necessary. If a process has been kept in control, acceptance tests need not be made, provided, of course, that quality is solely dependent on the process.

Process controls are made to determine if production methods are varying because of assignable causes. As examples of process controls we might consider the products from automatic screw machines, annealers, wire-drawing machines, printing presses, stamping machines, grid (radio tube) winding machines, ceramics and plastic extrusion machines, furnaces, spring-forming machines, in fact any automatic or semi-automatic process in which variations in the product are a result of variations in the process.

Product controls are made to determine whether deviations from present quality levels are occurring when the products have unknown histories, or when their manufacture is the result of many processes (automatic, semi-automatic or both) and assembly operations. The objective, then, is to evaluate the end

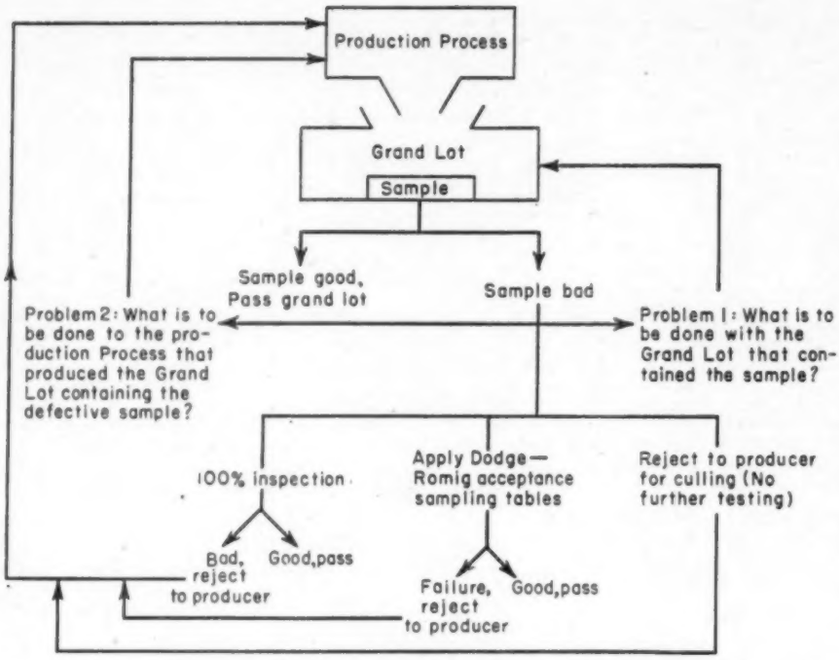

Production Process
Grand Lot
Sample
Sample good, Pass grand lot
Sample bad
Problem 2: What is to be done to the production Process that produced the Grand Lot containing the defective sample?
Problem 1: What is to be done with the Grand Lot that contained the sample?
100% inspection
Apply Dodge—Romig acceptance sampling tables
Reject to producer for culling (No further testing)
Bad, reject to producer
Good, pass
Failure, reject to producer
Good, pass

Fig. 2—Two problems arising from out-of-limit values and their solutions are indicated diagrammatically. Problem 1 has three suggested solutions. Problem 2 is automatically solved by following recommended control procedure, according to number of out-of-limit points

CHARTS HELP DIAGNOSE QUALITY PROGRESS continued

product of the industrial activity up to the point of control.

The control chart is capable of disclosing much information if one takes the time to observe the curves and investigate the causes of observed fluctuations.

Let us assume that one keeps records of the average, or arithmetic mean, $\overline{X}$ and either the range R or the standard deviation σ of a number of samples. With relatively few samples, 35 samples of 5 pieces each, we can determine the following:

1. Mean average value $\overline{\overline{X}}$ of the average readings.
2. Mean range value $\overline{R}$ of the readings.
3. Expected variation of $\overline{X}$ from chance causes only.
4. Standard error of the means, $\sigma_{\overline{X}}$ and $\sigma_{\overline{R}}$.*
5. Expected variations of range R from chance causes only.
6. Ability of the process or product to be controlled in its present condition within specified tolerances.
7. Production trends, if any.
8. Evaluation of inspection technique and gages.
9. Existence of a controlled product or process.
10. Existence of an uncontrolled product or process.
11. Cost analysis data.

If one prefers to keep charts on a qualitative basis and records either (1) fraction defective p, (2) number defective pn when n is sample size, or (3) the number of defects c, then information to be obtained from the charts includes:

1. $\overline{p}$, $\overline{pn}$ or $\overline{c}$.
2. Presence or absence or larger values of $\overline{p}$, $\overline{pn}$ or $\overline{c}$ than can be assigned to chance.
3. Ability of the product to be made by the existing process at the desired quality level.
4. Existence or non-existence of control.
5. Cost analysis data.

Normal Curve Relationship

Consideration of the control chart inevitably brings up the relationship between computed statistics and charted values. The relationship is simply this: $\overline{\overline{X}}$ (or $\overline{p}$, $\overline{pn}$ or $\overline{c}$ as the case may be) corresponds to the value of the normal distribution at the value $\sigma = 0$.

Computed limits on the central chart represent values at the ends or tails of the normal curve, being either 3σ limits or the various probability limits, depending on values selected. Any points found to exist beyond limits must be considered as resulting from assignable causes. Warning lines can be placed at the 2σ values or whatever one decides to use, depending on the economics and inherent control of the activity being charted.

In Table 1[1] are given the various statistics, together with their 3σ limits and the conditions under which they are used. Table 2 is reproduced from the ASTM Manual on Presentation of Data, Supplement B.

If it is desirable to establish 2σ limit values as warning lines, they can be computed from the formulas given under the heading "Equation," Table 1, by substituting the number 2 for the value 3.

To illustrate the use of these tables, the formulas being obtained from Table 1 and the value of the factors A, D_1, D_2, etc. from Table 2, the resistance of five heater wires are measured giving the following results:

Wire No.	Resistance X
1	1.362
2	1.350
3	1.350
4	1.350
5	1.338
Total, ΣX =	6.748
Average, $\overline{X}$ =	1.350
X max. =	1.362
X min. =	1.338
Range R =	0.024

Taking 25 such samples of 5 units each supplies the following data:

Sample No.	$\overline{X}$	R
1	1.350	0.024
2	1.324	0.012
3	1.343	0.012
4	1.338	0.000
5	1.350	0.012
6	1.340	0.012
7	1.369	0.012
8	1.381	0.012
9	1.369	0.024
10	1.355	0.012
11	1.345	0.012
12	1.355	0.012
13	1.369	0.012
14	1.352	0.012
15	1.362	0.024
16	1.364	0.012
17	1.340	0.024
18	1.336	0.012
19	1.340	0.012
20	1.348	0.024
21	1.350	0.024
22	1.340	0.012
23	1.345	0.012
24	1.340	0.012
25	1.343	0.012

$\Sigma\overline{X} = 33.748$ $\quad \Sigma R = 0.360$

$\overline{\overline{X}} = 1.34992$ $\quad \overline{R} = 0.0144$

If it is assumed that a standard

*$\sigma_{\overline{X}} = \frac{\sigma_X}{\sqrt{n-1}}$ . . . (See "Elementary Statistics" p. 343, by M. M. Blair, Henry Holt & Co.

TABLE 2—FACTORS FOR COMPUTING CONTROL CHART LINES — SMALL SAMPLES

Number of Observations in Sample, n	Chart for Averages			Chart for Standard Deviations					Chart for Ranges				
	Factors for Control Limits			Factor for Central Line	Factors for Control Limits				Factor for Central Line	Factors for Control Limits			
	A	A_1	A_2	c_2	B_1	B_2	B_3	B_4	d_2	D_1	D_2	D_3	D_4
2	2.121	3.759	1.880	0.5642	0	2.064	0	3.658	1.128	0	3.686	0	3.268
3	1.732	2.394	1.023	0.7236	0	1.948	0	2.692	1.693	0	4.358	0	2.574
4	1.500	1.880	0.729	0.7979	0	1.859	0	2.330	2.059	0	4.698	0	2.282
5	1.342	1.596	0.577	0.8407	0	1.789	0	2.128	2.326	0	4.918	0	2.114
6	1.225	1.410	0.483	0.8686	0.003	1.735	0.003	1.997	2.534	0	5.078	0	2.004
7	1.134	1.277	0.419	0.8882	0.086	1.690	0.097	1.903	2.704	0.205	5.203	0.076	1.924
8	1.061	1.175	0.373	0.9027	0.153	1.653	0.169	1.831	2.847	0.387	5.307	0.136	1.864
9	1.000	1.094	0.337	0.9139	0.207	1.621	0.227	1.774	2.970	0.546	5.394	0.184	1.816
10	0.949	1.028	0.308	0.9228	0.252	1.594	0.273	1.727	3.078	0.687	5.469	0.223	1.777
11	0.905	0.973	0.285	0.9300	0.290	1.570	0.312	1.688	3.173	0.812	5.534	0.259	1.744
12	0.866	0.925	0.266	0.9359	0.324	1.548	0.346	1.654	3.258	0.925	5.593	0.284	1.717
13	0.832	0.884	0.249	0.9410	0.353	1.529	0.375	1.625	3.336	1.026	5.646	0.308	1.692
14	0.802	0.848	0.235	0.9453	0.378	1.512	0.400	1.599	3.407	1.121	5.693	0.329	1.671
15	0.775	0.817	0.223	0.9490	0.401	1.497	0.423	1.577	3.472	1.207	5.737	0.348	1.652
16	0.750	0.788	.....	0.9523	0.422	1.483	0.443	1.557	.....	.....	.....	.....	.....
17	0.728	0.762	.....	0.9551	0.441	1.470	0.462	1.539	.....	.....	.....	.....	.....
18	0.707	0.738	.....	0.9577	0.458	1.458	0.478	1.522	.....	.....	.....	.....	.....
19	0.688	0.717	.....	0.9599	0.473	1.447	0.493	1.507	.....	.....	.....	.....	.....
20	0.671	0.698	.....	0.9619	0.488	1.436	0.507	1.493	.....	.....	.....	.....	.....
21	0.655	0.680	.....	0.9638	0.501	1.427	0.520	1.481	.....	.....	.....	.....	.....
22	0.639	0.662	.....	0.9655	0.513	1.418	0.531	1.469	.....	.....	.....	.....	.....
23	0.626	0.647	.....	0.9670	0.525	1.409	0.543	1.457	.....	.....	.....	.....	.....
24	0.612	0.632	.....	0.9684	0.535	1.401	0.552	1.447	.....	.....	.....	.....	.....
25	0.600	0.619	.....	0.9697	0.545	1.394	0.562	1.438	.....	.....	.....	.....	.....

does exist and the value is $X' = 1.35$ and $\sigma = 0.035$, the central line in the control chart is $\overline{X'} = 1.35$ and the limit values about $\overline{X'}$ are $\overline{X'} \pm A\sigma'$. This is given in the second line of Table 1.

Computed limit values then are:

$$\overline{X'} \pm A\sigma' = 1.35$$
$$\pm (1.342 \times 0.035)$$
$$= 1.35 \pm 0.0467$$
$$= 1.397 \text{ and } 1.303.$$

The central line of the range chart $= d_2\,\sigma' = 2.326 \times 0.035 = 0.081$. Control limits about the central line of R are

Lower limit $= D_1\,\sigma' = 0$

Upper limit $= D_2\,\sigma'$

$= 4.918 \times 0.035 = 0.172$

These central lines and their limits are shown in Fig. 1 as solid lines *a*, *b*, *c*, *d*, *e* and *f*.

If it is assumed that no standards exist, an entirely different set of values are obtained from the same data. In this case the central line for average $\overline{X}$ is $\overline{\overline{X}} = 1.34992$.

Limit values for average $\overline{X}$ are

$$\overline{\overline{X}} \pm A_2\overline{R} = 1.34992$$
$$\pm (0.577 \times 0.0144)$$
$$= 1.34992 \pm 0.00831$$
$$= 1.358 \text{ and } 1.341.$$

Central line for R is $\overline{R} = 0.0144$.

Limit values for R are

Lower limit $= D_3\overline{R} = 0$

Upper limit $= D_4\overline{R}$

$= 2.114 \times 0.0144 = 0.030$

These limit values are shown in Fig. 1 as dotted lines *a*, *b*, *c*, *d*, *e* and *f*.

Control Procedure

It is well to consider the sequence of events which occur in a factory as a product goes out of control. What we shall state here is not given as the final or only method of operation, but indicates a procedure which the author has found uniformly successful.

When a single point exceeds the warning line, the foreman is notified. When a single point exceeds the 3σ limit, again the foreman is notified. When two successive points exceed the control-limit values, the engineer and foreman are notified.

Should control limits be exceeded three successive times, the foreman, engineer and the quality engineer are notified. In this latter condition, the process or product is considered out of control and is subject to engineering experimentation until 25 successive values are found to be within the control limits, at which time the control is reinstated.

Advantages of this procedure are:

1. The cooperation of the foreman is insured by giving him "first crack" at all trouble or impending trouble.

2. Engineers like the system because it advises them of trends and calls them in at the first indication that trouble is occurring.

3. By putting the responsibility on an executive level, the quality engineer, engineer and foreman cannot flounder indefinitely when corrective measures are not immediately apparent.

Charts Do Not Control Quality

Regardless of what charts are used in factory activity, one basic fact remains: Charts in themselves do not control quality, but are charts of the control of quality. Control of quality depends on engineering activities and production management.

At the best, we should only use the chart as an index of the efficacy with which the quality is being controlled. It is poor logic indeed to say after three consecutive points register out of control, "Let's take another sample, maybe this one will be all right."

Unless some engineering change has been made, it is more than likely that the product will not suddenly suffer a "change of heart" and be good from then on. It is better than an even chance that should the optimistically selected sample fall within the control limits, the assignable cause which pushed the three consecutive values beyond the out-of-control limits will again manifest

itself during the next group of 25 samples.

The control chart has as much control over quality as the thermometer has over the temperature of a furnace.

In contrast to the conditions which induce analysis and acceptance sampling, it is possible (indeed it is the intent) to effect changes on the production process used in making the units being inspected. If we consider the production process as the supplier of separate quantities of material, each of which we shall refer to as a grand lot, and each grand lot of which is accepted or rejected on the basis of the control sample, we can realize almost immediately what are the two main problems associated with control sampling.

Should the sample be good, there are no problems. If the sample is bad and gives rise to out-of-limit values, we are faced with the two problems:

1. What is to be done with the grand lot that contained the sample?
2. What is to be done to the production process that produced the grand lot containing the defective sample?

With respect to question 1, the grand lot (Fig. 2) can be disposed of on the basis outlined under acceptance sampling using the Dodge-Romig tables[3], or if desired it can be returned to the producer to be culled and then a new grand lot submitted. Unless there is considerable production pressure for the units being adjudged, it is desirable to return questionable material to the source.

The reason that rejection to the producer is a preferred procedure is simply that the responsibility for the manufacture of quality products rests on the producer, or seller, of the product rather than on the consumer, or buyer. The sooner and the more emphatically the question of failure to meet quality standards is brought to the attention of the producer, the more likely the situation is to be brought to a head and solved.

Firm and unequivocal rejection is a method of bringing the problem to the foreground forcefully. Some may consider this a "hardboiled" approach, but on the other hand there is nothing "softboiled" about manufacturing defective material.

This writer knows only too well the difficulties of being firm and unyielding in the face of a stampede of production men, foremen and expediters. It requires emotional stability, self control, confidence and the proverbial "intestinal fortitude." Unless an engineer has these attributes, it is better that he seek a calmer occupation than that of quality engineering.

If the recommended sequence of notification for out-of-limit samples is followed, the answer to question 2 is automatic. The persons most familiar with the process or product are already automatically informed—foremen, engineer and quality engineer.

Unless both problems are solved constantly for each and every out-of-control point, the control-chart method of controlling quality is not being applied to its greatest advantage.

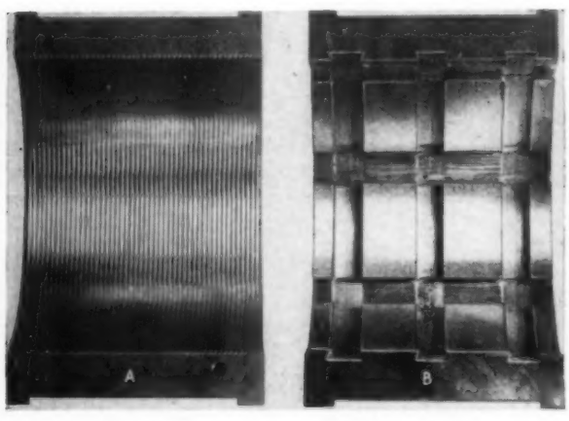
1. *"Quality Through Statistics" by A. S. Wharton, The Gryphon Press, Highland Park, N. J.*
2. *American War Standards Guide for Quality Control Z1.1-1941. American Standard Association, 29 West 39th St., New York City.*
3. *"Single Sampling and Double Sampling Inspection Tables" by H. F. Dodge and H. G. Romig.*

PREPARING BEARING SHELLS FOR BABBITTING

BY A. A. GOODMAN
Steam Division
Westinghouse Electric Corporation
South Philadelphia, Pa.

YEARS AGO, when the predominant number of large babbitted bearing shells were made of cast iron, a series of axial and circumferential dovetailed slots were cut into the bore of the shells prior to pouring of the babbitt. Babbitt, being composed largely of tin and lead, will not bond readily to cast iron and therefore the intent of the slots was to assure the anchoring of the babbitt lining to the shell.

In the transition from the use of cast iron to steel and bronze shells which would bond to babbitt, these slots were dispensed with in the smaller sized bearings. The larger bearings however, regardless of material, still carried the slots as an additional factor of safety against the chance of having the babbitt lining loosen away from the shell.



Serrations A, 12 to the inch, in the bore of large bearing shells have 50% better holding power for bonding to the babbitt than the old-fashioned dovetail slots B, and because the serrations are cut in a lathe, the whole slotting operation is eliminated

Early in the last war, the importance of saving man and machine hours plus the critical shortage of tin resulted in the acceptance of a shop suggestion to replace the slots with a serrated bore. A 12-pitch serration which gives approximately 50% more surface per linear inch than a smooth bore was decided upon. The saving in babbitt that formerly filled these slots was considerable and the saving in man and machine hours was indeed welcome. The slotter operation (axial dovetails) was thereby eliminated and the entire bore now is finished on the lathe or boring mill on one setup.

This serrated bore is now used on all bearings except those made of cast iron and aluminum bronze, which will not bond to babbitt without special salt bath treatments or electroplating.

Processes and techniques for industrial photography are well developed. Help with special problems can be obtained from the makers of films and cameras or from commercial photographers

HOW Photography HELPS PRODUCTION

BY RUPERT LE GRAND

ASSOCIATE EDITOR

PHOTOGRAPHY is a versatile tool. There are literally scores of current uses in Metalworking, and there will be more as shop men realize the time and money savings that can be made directly in their work. Functional photography is much more than the taking of occasional pictures of machines or setups. It reduces templet making time as much as 90%, prints fabricating instructions direct on metal, helps to speed up machines and refine processes. The field of contour machining is being broadened by photography. Tool engineers find that photographs of chart-gage images aid in production research and tool development. Plant layout is being done with a sharp reduction in engineering labor through an application of photography. Design costs less when replicas of standard-part drawings are applied to assembly layouts of custom-engineered equipment. Photographic records of non-destructive tests are being used to improve products.

Partial List of Subjects

TOOLING UP

CONTROL OF CONTOUR MACHINING PROCESSES

CHART GAGES FOR OPTICAL COMPARATORS

WORK LAYOUT

WORKER TRAINING

RECORDING OPERATOR PERFORMANCE

STILL PICTURES

MOTION PICTURES

STUDY OF MACHINES

NON-DESTRUCTIVE TESTS

SAVINGS IN DESIGN

PHOTO LAYOUT in Design and Fabrication

In the aircraft-templet field, photo-layout methods cut costs by 75%, time by 90%; in other peacetime applications large savings are being realized

THERE ARE numerous and growing uses for photography as a timesaving, inexpensive and accurate means of reproducing drawings in the same, reduced or enlarged scale. The list of current applications might be:

(1) Templet photography — continued use in aircraft, but now being applied by designers of automobile bodies and streamlined trains —also parts and tools that require lofting to produce correct contours at important cross-sections.

2. Sensitized work layouts on sheet or plate to be bent, sheared, drilled or torch cut.

3. Low-cost nameplates, wiring diagrams on control boxes, decorative panels, instrument dials.

4. Revitalizing of tracings.

5. Production of high-contrast black-line on white photographic prints of drawing for file or permanent reference.

6. Custom-engineered designs around standard parts by placing photo prints of standards in position on the drawing and connecting with necessary details.

7. Preparation of plant layout boards upon which planning engineers erect three-dimensional models.

8. Enlarged templets for use with machine tools that shape, rout or grind forms or contours. Also templets for use with optical comparators or contour-measuring projectors.

9. For layout of castings by projecting datum lines and hole centers from photographic masters.

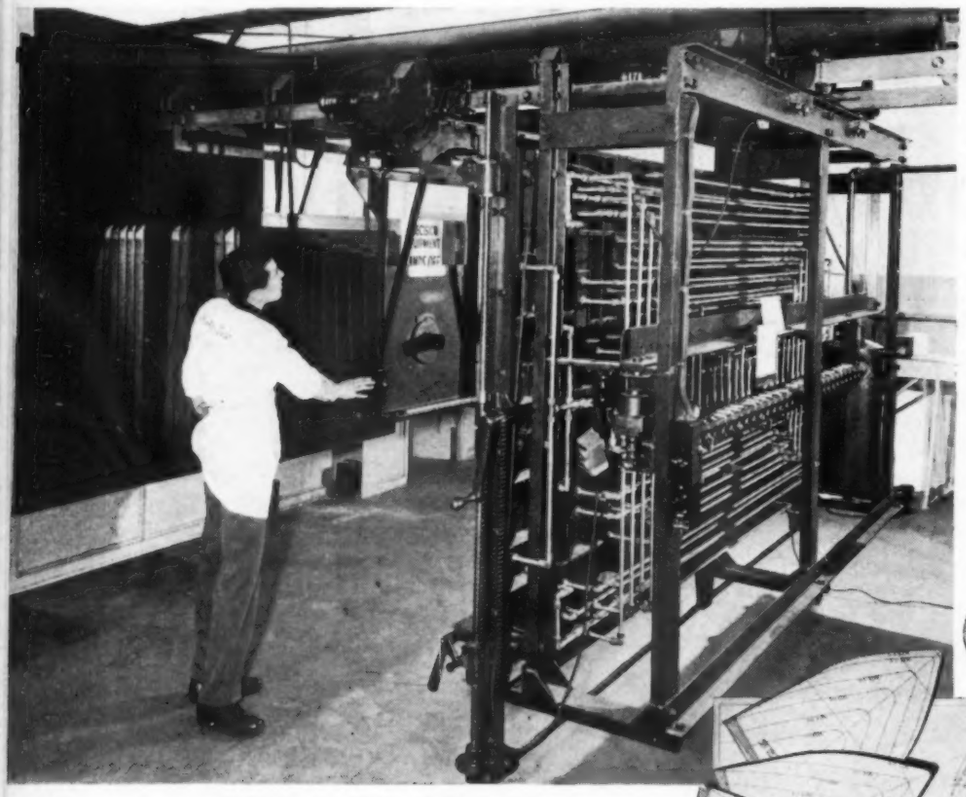
In short, there is evidence that few shops possess an over-all knowledge of the possibilities of photo layout. Hence the accompanying round-up of processes is offered.

Templet Photography

Coordination of sheet-metal components of an airplane, automobile body or streamlined locomotive requires use of accurate templets for building and inspecting the necessary tools and assembly jigs. Engineering drawings in third-angle projection do not show true curves at important cross-sections, or "stations"; hence, the design is lofted. The loft lines are drawn or scribed on material that is relatively stable —steel or aluminum or plastic sheet such as Vinylite. Metal sheets are commonly painted write or green for contrast. Plastic sheets may be clear or translucent, but with a surface that will take pen or pencil.

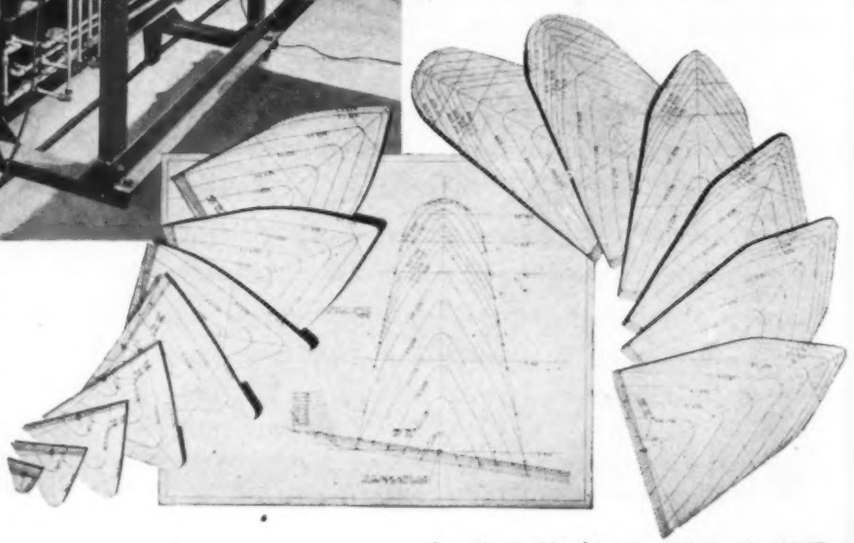
Loft drawings are masters. So a photographic duplicating process is needed, to save drafting labor. Copies may be same size, scale-model size, oversize for shrink allowances, and reversed for right or left hand. For durability, copies are normally made on sensitized sheet metal but Masonite and plywood have been used. Cut-out replicas of the various station outlines may be assembled for a mockup, or fitted with drill bushings to become master drill-plates or used in pattern making.

There are at least four photographic methods of transferring the loft drawing to sensitized templet stock: (1) projection, (2) contact printing, (3) reflection printing and (4) X-ray printing. Before considering these, templet-sensitizing methods should be understood.



COURTESY NORTHROP AIRCRAFT INC.

HUGE CAMERAS installed by aircraft companies, provide maximum flexibility in reproducing loft drawings in same, scale-model or enlarged size



COURTESY REPUBLIC AVIATION CORP.

MASTER LAYOUTS are often made in composite form, and photographic reproductions are cut up to form templets

Templet Sensitized Methods—(1) a water emulsion (Ansco, DuPont Defender or Glenn L. Martin materials) may be sprayed on the templet stock, or (2) a transfer paper (Kodak Linagraph or Di-Noc's Dinoloft) can be laminated or cemented to the cleaned, primed and possibly lacquered surface of the templet. Transfers consist of a thin film of emulsion and a paper backing, the latter being stripped off prior to printing. Darkroom procedures are necessary.

Spray emulsions require the least equipment for application, can be applied to any size of sheet. Ready-made solutions require refrigeration, keep only a short time: those supplied in dry form remain good until needed.

Transfer papers are light-safe until the paper covering is stripped off. They may be applied to large sheets, which are stored until needed and then cut to size. Laminating equipment is expensive. Quantity production requires close control of all variables. But there are possibilities that the laminating, printing and developing processes can be put on a production-line basis, and applications may extend to instrument dials and similar uses.

Templet Printing Methods

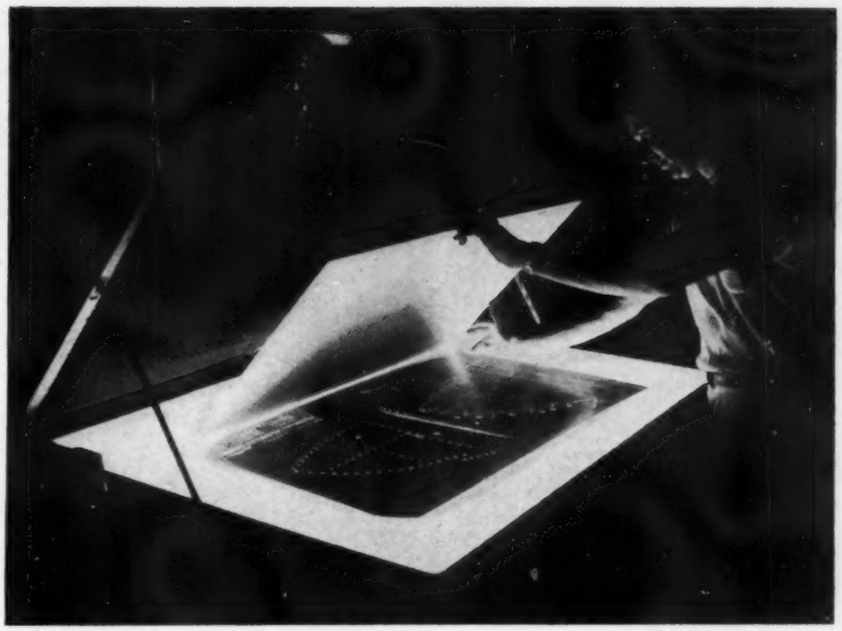
Projection Process—Drawings as large as 5x10 ft. are photographed in reduced size on glass negatives (Kodalith) by means of huge cameras. After development, the negative is replaced in the camera or put into a special projector and projected full size, oversize when shrink templets are involved, or to scale model size onto sensitized sheet metal. Precision focusing results, it is said, in less dimensional error than the tolerance in lofting the original. This process, except in the smaller sizes of templets, is costly because of the equipment involved, but is perhaps the most versatile in application. It is suggested that aircraft companies may have open time for making lofts and templets on a contract basis.

Contact printing—In this process the loft drawing must be made on transparent material, either coated glass or processed Vinylite such as Di-Noc's Dinobase. The completed drawing is placed in a contact frame with a sensitized vinylite material like Dinographic film and exposed. After development, the intermediate negative is printed on sensitized metal.

Reflection printing—In case preference is shown for a metal loft drawing, and same-size templets suffice, a negative can be made on glass (maximum convenient size about 4 x 6 ft.) to which Kodak Reflex Copy paper has been laminated or on a Vinylite white-base film known as Dinoreflex and made in sizes up to 36x72 in. In either case, the emulsion side of the negative material is placed in contact with the loft drawing. Exposure is made by the cumulative effect of light passing through the back of the film or glass plate and being reflected back onto the emulsion. The negative so made may be printed on templet stock.

X-ray luminescent printing—Very large drawings are reproduced sharply on templet stock by use of luminescent drawing boards. The metal loft board, preferably aluminum, is primed, painted with a black guide coat like Eastman Lamikote Black and then with a phosphorescent material like Eastman Luminescent Lamikote. The drawing is made on the last material with India ink or pencil and excited briefly with X-rays. Then the glowing board is placed in contact with an X-ray negative. After development, the X-ray negative is clamped in contact with sensitized templet stock. This process produces a properly oriented black line-on-white replica.

The intermediate negative in luminescent printing is eliminated by the Loftec Process, developed by Republic Aviation Corp., and now handled by Loftec, Inc., Warren, Ohio. A metal negative is prepared by spray coating with a luminous paint and then an opaque paint or lacquer. The loftsman scribes the layout through the top coating, puts on lettering in reverse. After excitation by strong light, the negative is loaded into a contact printer with a sensitized templet material. Clear Vinylite can also be used as the negative material, only an opaque coating being applied. Lines scribed through the coating permit passage of light for contact printing.



NO CAMERA is needed in the Loftec process, in which the layout is scribed through an opaque coating, and the luminescent undercoating is excited by strong light to print sensitized templet stock

TEMPLETS for Inspection and Machining

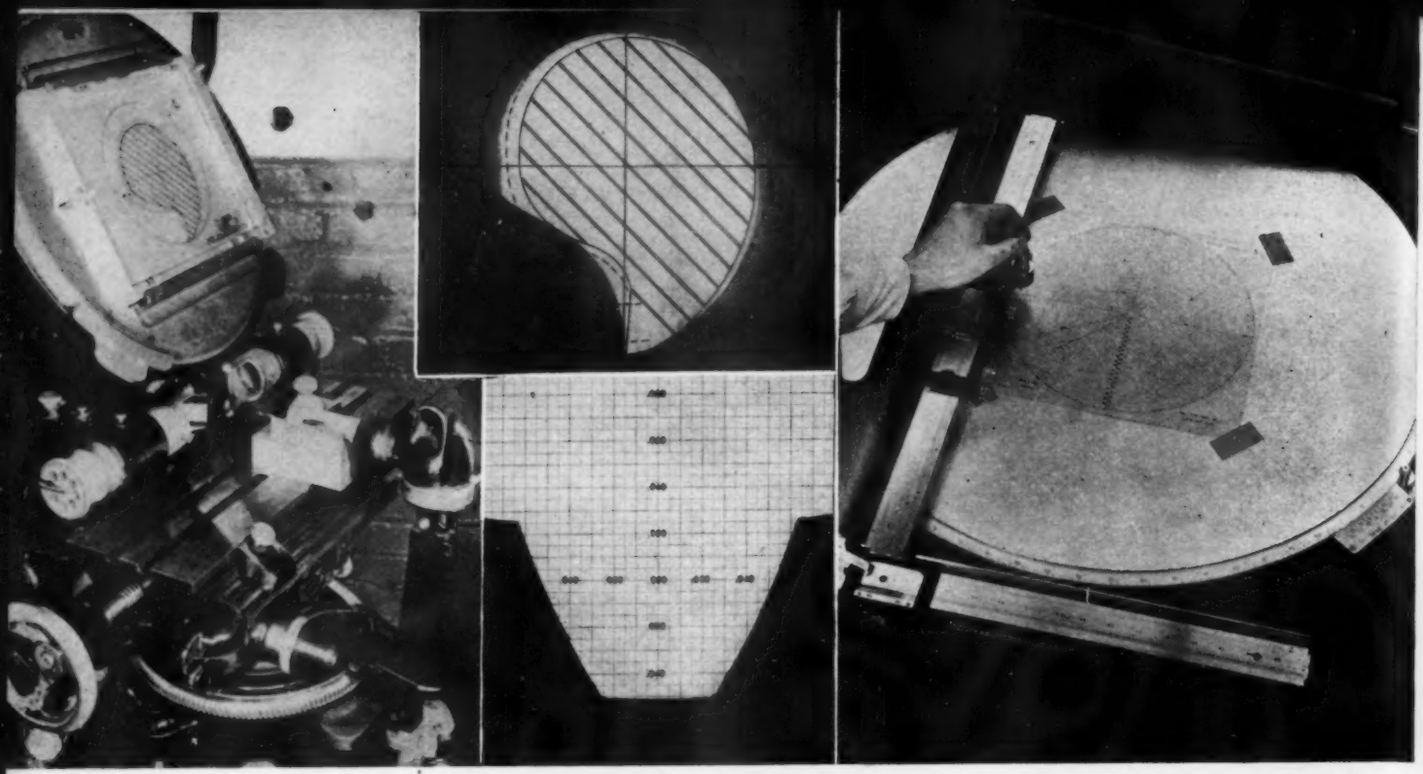
GREAT strides in the layout, machining and inspection of contour work are currently being made through the use of templets enlarged from 10 to 100 times. Photography is essential:

1. To make durable tracer-control diagrams.

2. To duplicate exactly a master layout when making charts for optical comparators and contour measuring machines.

3. To record the image seen on the optical-comparator chart, when errors in tools must be corrected.

Tracer control diagrams can be



IMAGES OF TOOLS are photographed to show the toolmaker or vendor exactly where inaccuracies occur, and for production research. Left—A plate holder is placed over the chart gage. Upper center—Before taking the picture, the router-bit image was aligned with datum lines on the chart gage. Lower center—Spline teeth checked on a grid-screen chart gage. Right—Weldon Tool has special equipment for chart gage layout for customers

produced in three ways: (a) by printing the drawing on sensitized metal (Transfax process), or (b) by printing the drawing on sensitized paper laminated to metal or plywood (Linagraph or Dinoloft process), or (c) making a reverse plate as in photo-engraving and etching the lines deeply for a stylus track.

The making of master templets and translucent charts for optical comparators and contour-measuring machines is a specialized process. The Jones & Lamson Machine Company has for years supplied standard and special charts, but additional firms now in the field are: Engineers Specialties Div., Universal Engraving & Colorplate Co.; Gage Company Div., Gage Printing Co., Limited; and the Weldon Tool Company.

Glass and vinylite are used to make the master layout and the charts. For layout of the master templet, these materials are employed: coated engineer's glass (red-coated engineer's glass, either plain or graph style, made by Engineers Specialties Div., and the Kodak Green Scribing Plate) and green-coated vinylite (made by Di-noc). The Weldon Tool Company's process for producing the master layout is presumably typical:

In the Weldon method, a special layout machine is used to scribe lines 0.004 in. wide through the green coating and to an accuracy of half a thousandth. Horizontal, oblique and vertical lines are scribed, also arcs of circles. Thus, radius charts, part layouts, gear or thread profiles can be made in the desired standard or special enlargement. After the plate is scribed and checked it is sprayed with clear hard lacquer to protect the gelatin surface. Then the master layout may be used directly on the optical comparator or contour measuring machine, or used to produce replicas on sensitized vinylite (Dinographic) film. The resultant print has fine but sharp black lines on a matte surface. Bright-line duplicates of the original scribed plate are made by a photographic etch process.

Plastic Chart Gages

Gage Printing Div. also makes plastic comparator charts by photographic reproduction from master layouts. These charts are 0.100 in. thick, and the characteristics of the plastic are said to prevent changes in form or size.

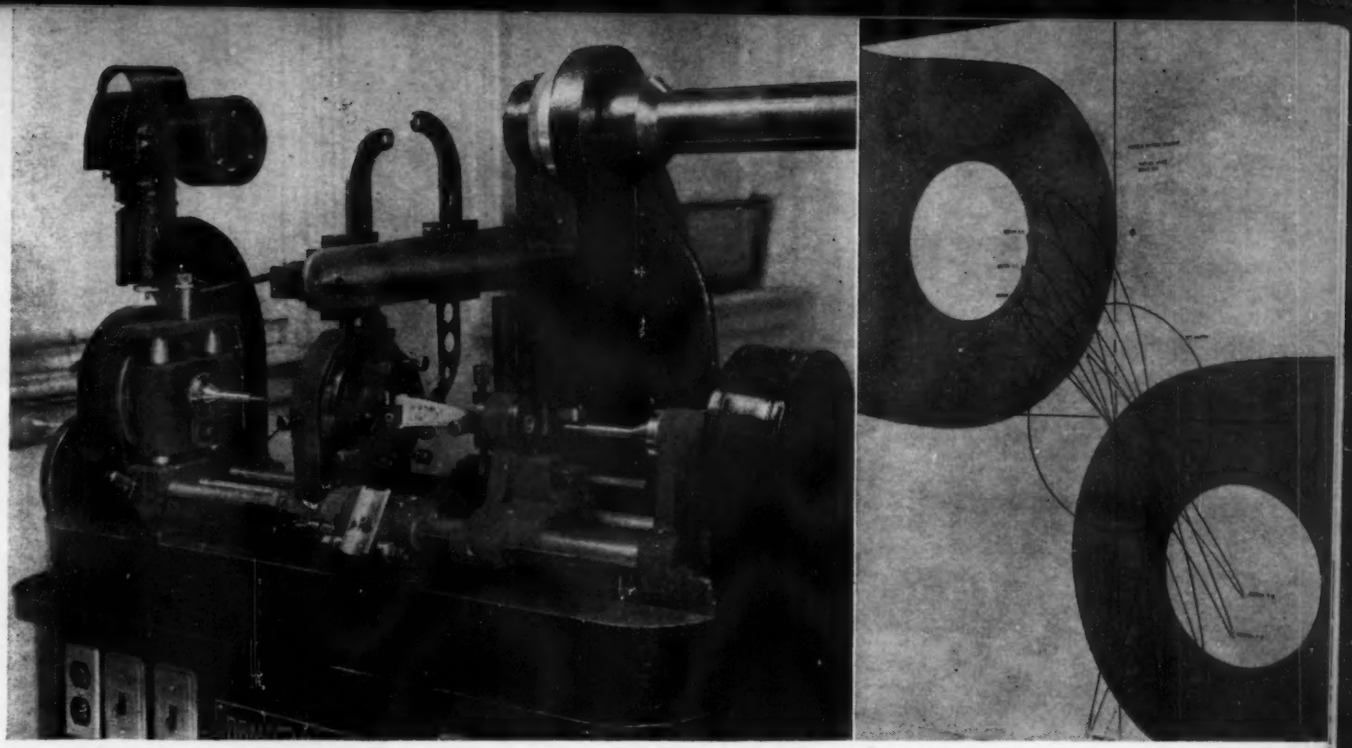
Di-Noc Company supplies green-coated vinylite for making the magnified master layout and also sensitized vinylite for producing duplicates.

Engineer's Specialties has facilities for accurate layout on red-coated engineer's glass in customary comparator screen sizes and even for the new, extremely large layouts that are now coming into use for special checking and layout operations. Duplicates are produced photographically on ground plate glass. The lines are made integral with the surface by a special process. Translucent engineer's glass, with vellum laminated to the surface, is also supplied for pencil or ink layouts for comparator charts, and photographic duplicates can be made.

Kodak Green Scribing Plates can be contact printed on Kodalith Orthochromatic glass plates.

Considerable success has been achieved experimentally in using scribed coated-glass plates or bright-line prints made from them to control optical form grinding (as in jet-propulsion blades). The workpiece is placed in a fixture and its outline projected onto the screen of an optical comparator attachment. The operator sees the wheel cutting into the blank by means of spark images. When the form is cut to the line, it is intensely illuminated by the sparking effect, and grinding is stopped.

Photographs of the magnified shadow of the workpiece are used to evaluate tools, advise the shop and vendors of product and tool inaccuracies. Three methods of making such photographs tell a complete dimensional story (and form errors too) were reported in the *Tool Engineer*—Nov. 1946 by M. W. Seavey, research engineer in the Pre-Planning & Tool Design Dept. of Lockheed. The photographs can be



TO CENTER jet-propulsion blades, the machine projects a sight-hole circle in upper end of the roller arm onto a 20:1 templet layout of airfoil sections (right). Blade is adjusted in chuck until sight-hole image remains tangent to the chart profile in all positions of roller on the blade profile. Then the roller arm is indexed to the next station

taken for several shop applications:

1. A scale at proper magnification is marked on the glass viewing screen of the optical comparator or contour measuring machine, and the photograph of part image and scale permits measurement of deviations from correct size.

2. A better method is to use a grid screen scaled in 0.001 in. increments at the magnification employed. These screens are made by Engineers Specialties and by Gage Company Div. Radius charts, thread and tooth form charts are standard items for such work.

3. A chart gage of the part or tool, complete with dimensions and tolerance lines, may be used.

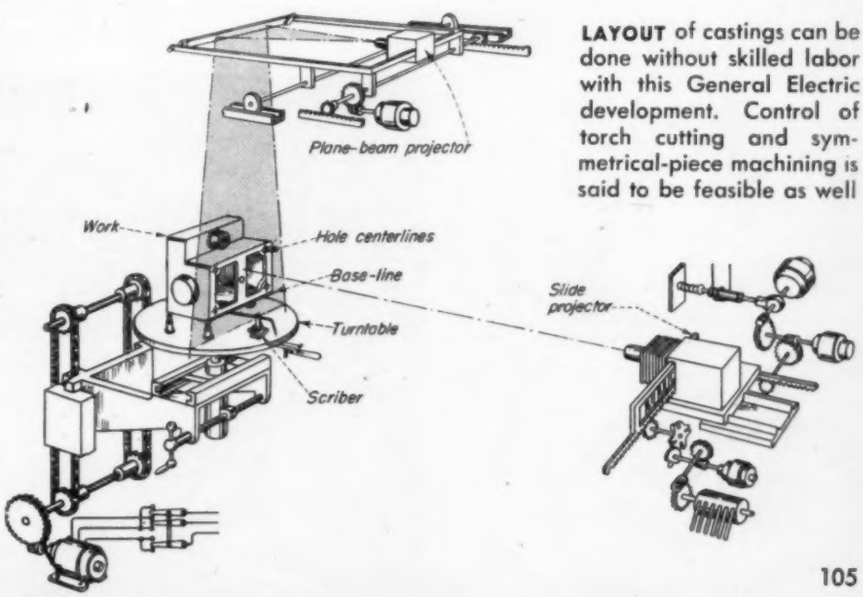
When the image is properly oriented with respect to datum lines or points on the chart or viewing screen, a photographic plate holder is clamped in position. To avoid errors arising from parallex the image side of the screen should face the negative. A reverse image is secured unless the chart gage has been lettered backward. Exposure is made by light transmitted through the viewing screen or translucent chart gages. The shadow should show gray in the developed film so that the chart lines can be seen. Measurement of the shadow can be done by applying an Engineer's Specialties glass projector scale (laid out at proper magnification) to the negative. Copy prints on paper may stretch, are thus less satisfactory than a film negative.

Photography Speeds 3-Dimensional Layout

ALTHOUGH PLAYING an inexpensive role, photography is actually the basic requirement in two systems of three-dimensional layout recently perfected.

For laying out intricate castings, the General Electric Company developed a machine that replaces skilled layout men. The work is put on a turntable, which is adjusted for height by a motor drive and for lateral position by a handwheel and screw. Drawings of the article, from several views, are photographed in reduced size upon plates. One drawing at a time is projected onto the workpiece. The plane of true projection and correct dimensions are established by a "light-wand," or plane-of-light projector. This device, operating in conjunction with the slide projector under Selsyn motor control, projects a plane-like beam downward onto the work.

As shown, the plane beam coincides with one face of the casting for scribing the baseline and centerlines for several holes. Then to layout the hole in the boss behind the surface just scribed, the projector is refocussed until the plane beam coincides with the face of the boss. Sub-



LAYOUT of castings can be done without skilled labor with this General Electric development. Control of torch cutting and symmetrical-piece machining is said to be feasible as well

sequently, the turntable is rotated to present another view of the work and the proper slide is used in the projector. A layout accuracy of 0.015 in. has been obtained, using women operators.

It is necessary to center jet-propulsion blades to the center of gravity of the air-foil sections before the blade root is machined. Profiles of air foils at three to five stations along the blade are laid out in 20:1 magnification and the chart gage master is printed on sensitized metal. This replica is placed 18 ft. from an Engineers Specialties air-foil centering machine.

To set up the machine, a set bar is placed between centers. Two roller arms, one for the front profile and one for the rear profile, are set to the master bar until sight holes in the upper ends of the arms are projected tangent with a master circle on the chart gage. The set bar is removed and the root end of the blade is chucked while the other end is gripped by a 4-screw equalizing chuck. With a roller touching a profile at the proper station, as selected by an indexing bar, the screws are adjusted until the sight hole circle, as projected on the chart gage, remains tangent (at all positions of roller) with a corresponding profile on the chart. This process is repeated at the several stations until all the air foil sections have been located at their center of gravity. Then drillheads are advanced to drill a locating hole in the tip and root. The blade is removed and the locating holes are used to set it up for machining the root.

Permanent Scales on Glass

Stainless-steel reticles or scales on eyepiece disks, radar scales, range-finder targets and other rectilinear or curvilinear markings on glass can be produced with a process developed by Bausch & Lomb Optical Co. The stainless-steel lines (as fine as 0.002 mm. wide if desired and extremely sharp) can be applied to flat or spherically curved disks or glass strips. The master drawing is photographed 1/5th to 1/20th original size on glass. The plate is placed in contact with a sensitized workpiece and exposed. Unexposed emulsion is washed off and stainless steel evaporated onto the part. Finally, the piece is swabbed with caustic, removing the stainless steel except in the originally clear areas.

Drawings Reproduced on Metal

There are definite uses for a process which enables a plant to print a line drawing directly and accurately on a sensitized metal surface, or on plastic, hard rubber or other nonporous sheet material. With Kodak Transfax light-sensitive process, a white line on black background print is secured when a drawing is printed in contact with the metal, and conversely a black-line positive is secured if a photographic negative is made of the working drawing and is used for the printing medium. The uses for this process are:

1. Working drawings can be printed directly on sheet metal or plate to inform shop operators how and where to shear, torch cut, bend, drill, and tap flat material.

2. A Transfax grid has been applied to sheet metals like aluminum to study plastic flow in deep drawing.

3. Nameplates, escutcheons, wiring diagrams, instrument dials can be printed economically in small quantities, and there is a likelihood that production-type equipment will make the process feasible from the cost standpoint when making such replicas in large quantities.

4. Right- and left-hand layouts are made by putting the proper side of drawing in contact with work.

Five steps are required:

1. Clean the metal, spray or wipe on a primer and allow to dry.

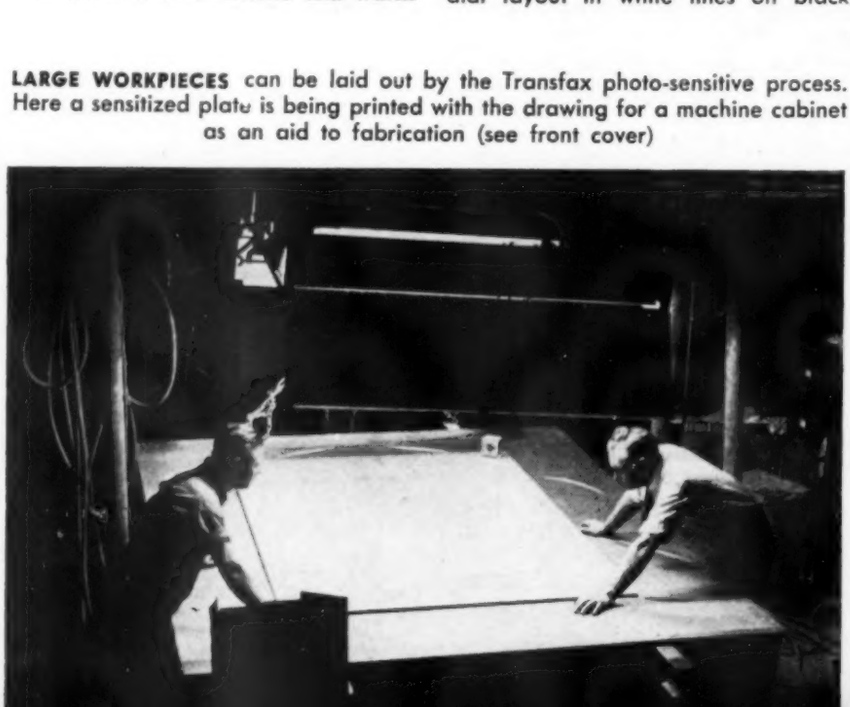
2. Spray the Transfax coating. Material is dry when it hits.

3. Place drawing in contact with spray-coated metal and expose under strong light.

4. Wash with ammonia and warm

INSTRUMENT DIAL manufacture by the Transfax process: Top—Spray coating onto metal; Center—Place drawing over sensitized piece and expose under strong light; Bottom—Wash off coating acted upon by light, leaving dial layout in white lines on black

LARGE WORKPIECES can be laid out by the Transfax photo-sensitive process. Here a sensitized plate is being printed with the drawing for a machine cabinet as an aid to fabrication (see front cover)



water, clearing off the coating that has been acted upon by light. Lines remain where overlay has protected coating.

5. Dry and overcoat with air-dry lacquer or baking lacquer.

Drawing Reproduction by Photo-Copy Methods

So far as reproducibility is concerned, engineering drawings range in quality from ink originals made on lightweight paper that transmits light well to pencil originals made with weak lines on heavy opaque paper. In any event, distribution of drawings is usually done in the form of blueprints or diazo prints in order to get the lowest cost per sq. ft. But photographic processes of reproduction step in when: (a) originals are shop worn or are difficult to reproduce, (b) revisions are desired in shortest time at least cost, and (c) long-lived file or record copies are needed.

Suppose that the drafting room has a lightweight pencil tracing that has become dog-eared. Negatives can be made by any one of these processes (in ascending cost); (1) silver-sensitized paper, contact exposed, (2) silver-sensitized paper, camera exposed, (3) high-contrast film, contact exposed, and (4) high-contrast film, camera exposed. Sensitized paper and high-contrast film both give more contrast than blueprinting or diazo printing processes, to pick up and exhance visibility of any line existing on the original. Hence, the revitalized negative can be printed on sensitized paper or cloth to make a positive as good as or better than the original. If desired, portions of the image can be bleached off the sensitized cloth after exposure, then the blank spaces are filled in with the new details.

Several kinds of equipment are available for reproducing drawings and other documents by the photo-copy method. These include Portographs (cabinet and continuous printers) made by Remington-Rand, and the Rectigraph produced by the Haloid Company. The cabinet type serves well for many sizes of drawings since, as in the case of the Portograph Model G 112, the maximum usable printing area is as large as 31x43 in. The original and the copy material—sensitized paper, vellum or tracing cloth—are placed in the bed of the machine, the cover is tightly latched against a rubber gasket and the vacuum draws the original and photo-copy material tightly together during exposure.

Microfilm "Dehydrates" Drawings

Any drawing, engineering proposal, instrument chart, radiograph or business document can be recorded by still photography, but the quicker, cheaper method is to microfilm such documents in bulk. Hundreds, even thousands, of pieces can be recorded on one roll of 16- or 35-mm. film. And once this is done, it is a simple matter to put the film in a reader to check details of the original or to make prints in an enlarger. In short, there are numerous ways that microfilm can be of service in a metalworking plant:

1. *Space Saving* — Microfilmed documents require about 1% of the space required by the original files.

2. *Protection*—Microfilm copies replace fire files. Microfilm copies have a rather firm legal status, but original drawings should not be willfully destroyed. Consult suppliers about state rulings on microfilm copies.

3. *Reference*—Film copies at key points in a plant or branch plants provide easier and quicker means of reference than blueprint file.

4. *Enlargements*—Prints in the original or workable size can be made on sensitized paper, vellum or cloth. Contrast quality is usually much higher than an original pencil layout. When drawings need revision, the microfilm picture is enlarged on sensitized tracing cloth, the area to be changed is blanked out, the new details are drawn in, and the new tracing then becomes the master drawing.

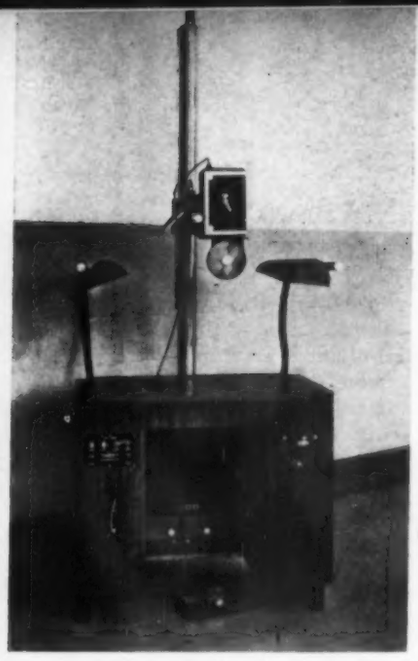
5. *Economy*—Microfilm copies are made quicker and more cheaply than blueprints for distribution to branch plants and even vendors. Approximate costs in one plant are: $17.50 per 1000 18x24-in. drawings; $24.50 per 1000 24x36-in. drawings (all on 35-mm. film). Commercial microfilm contractors may charge from $15 to $70 per 1000 drawings, depending on size and condition.

6. *Training* — Microfilms can be used like slide films. Portable enlargers are of value in this work.

Film Materials—Microfilming is presently done on two sizes of film 16- and 35-mm. Products used are: Ansco 35-mm. Minipan, Diebold 35-mm., Flofilm, DuPont 16- and 35-mm. Microcopy, and Recordak 16- and 35-mm. Safety Film. Negative film stock is used for the original microfilming process, and often these are filed as master copies, while positives are printed for direct

PHOTO-COPYING saves 90% of the draftsman's time when revising drawings. Here an operator is placing sensitized paper in the Portagraph Model G-112

MICROFILMING requires little space. The Diebold equipment consists of a camera (center), a developer (right) and a reader (left) to view pictures



READABLE photos (2⅝x3½) of documents are made on a sensitized paper with the Mini-Record camera

PORTABILITY allows this 35mm. Graflex Photorecord camera to be set up anywhere in the plant

DRAWINGS as large as 25x36 in. are microfilmed by the Recordak Model D camera at right

ANY DESIRED image can be located and read almost in full size on a Recordak reader at left

reading as circumstances demand.

The Haloid Company is making a 70-mm. sensitized paper in 100-ft. rolls with which 2⅝x3½-in. photographic copies of drawings and documents can be made on Mini-Record equipment. This size is convenient for filing on cards.

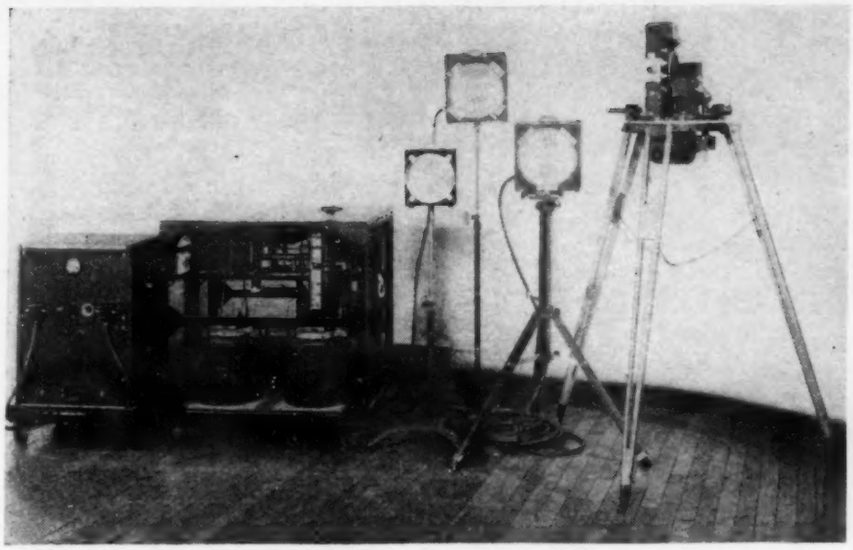
Equipment—Power-feed and flat-bed microfilming machines are made. Power-feed machines like the 35-mm. Diebold Flofilm and the 16-mm. Recordak accept material up to 14 in. wide by any length. Because of their higher operating speed and film economy, these cameras should be used for all records or drawings within their range. There are two types of power-feed machine: the Diebold advances the copy on a belt and the picture is made through a slit and lens system. Work and film move in synchronism, and the length of the document governs film image, so that images can be placed close together lengthwise. A double row of images can be put on the film. Reductions of 11, 19 or 24 times can be obtained by use of interchangeable lens mounts. The Recordak operates on the rotary principle, the copy passing over a drum in front of the lens slit. The film moves in synchronization with the drum and a reverse principle permits photographing both sides of a given document automatically. Documents may be fed either lengthwise or crosswise. The reduction is 24 to 1.

Graflex makes a flat-bed portable Photorecord camera, using 35-mm. film, which does much the same work as the power-feed machines discussed, except that operation is necessarily slower. It will photograph solids as well as the drawing, for perspective quality.

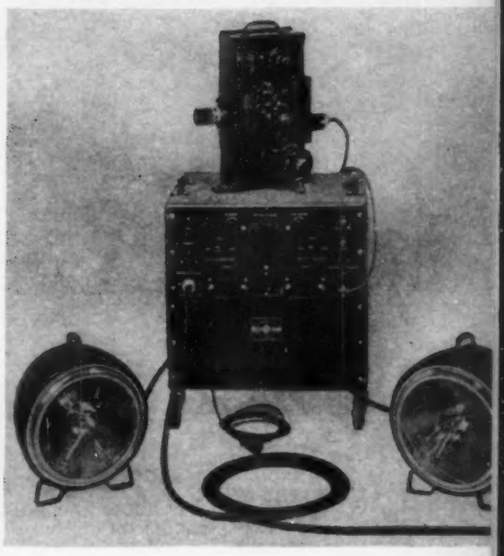
Recordak flat-bed equipment is made in table and floor models, with drawing capacities of 25x36 in. and 37½x52½ in., respectively, and reductions of 15 to 30 and 12 to 30 times, respectively. One large concern uses the table machine at a 22 to 1 reduction to handle 24x36-in. drawings and prefers to handle large drawings in sections.

Readers (special projection or viewing machines) are required. The Diebold reader accepts 16- or 35-mm. film which is projected full size on a brilliant screen. Operation is motorized, under control of a pushbutton or a speed regulating attachment. One Recordak reader takes 16-mm. film only, another accommodates either 16- or 35-mm. film. The latter machine is adjustable for magnifications of 12 to 23 times, and the projector head can be rotated so the image is placed in correct reading position regardless of its position on the film, and a scanning device permits maximum enlargement for any desired section of the drawing. Recordak also has a portable projector.

Indexing — Targets are photographed with a specific series of documents to identify, index and authenticate each reel of film. Detail procedures have been worked out for indexing purposes, but are too involved for analysis here. But with a properly installed system, it is easier for a draftsman or other person to locate the desired drawing on microfilm than it is to look up a blueprint in the file.



LOOM SHUTTLES move so rapidly that high-speed motion pictures are essential in design studies. Crompton & Knowles built this equipment for exposures of 1/200,000 sec. to provide clear definition



A POWER stroboscope and camera are combined by General Radio to take pictures at 500-1500 per sec.

HIGH-SPEED CAMERAS Probe Mechanical Secrets

THE HUMAN EYE is not built to follow the flight of a bullet, the action of a relay, the formation of a chip, the indexing of a high-speed machine, the plastic flow of metal in forging. But light can be made to expose a film in time intervals as short as 1/1,000,000th sec. With either a single- or multiple-exposed record, the mystery of what *actually* happens is revealed in measurable detail.

Recently a manufacturer of 20-mm. cannon improved the firing rate 25% by investigations with high-speed moving pictures. Prior to these studies the engineers could guess the reasons for certain stoppages, but they had no idea of occasional malfunctionings which prevented optimum speed of operation and reliability. But action was slowed to a snail's pace by photographing at 3200 frames per sec. and projecting on a screen at 16 frames per sec.—1/200th as fast. Unsuspected surges of the ammunition belt, hesitation in operation of the gas-recoil piston, became known.

Other examples of the uses of high-speed photography could be cited. But a discussion of the various methods and equipment used will presumably suggest applications in the reader's own work. And if he does not wish to purchase equipment, there are consulting photographers who take their specialized equipment right into the shop to produce the desired film studies.

Stroboscopic Techniques—A suitable stroboscopic tachometer and a high-intensity light source can be used in conjunction with ordinary cameras to record irregularities and defective operation of rotating or reciprocating mechanisms or elements. With General Radio's Strobotac stroboscope tachometer the mechanism may be made to nearly appear stationary, for observation of repetitive transient motions, vibration, chatter and other operational defects. Then the Strobotac can be connected to a Strobolux high-intensity light source. With an ordinary movie camera, slow-motion records can be made. The Strobolux can also be used for single-flash pictures, if motion can be stopped in 1/30,000 sec.

It is possible to set up a small mechanism on an optical comparator, project an enlarged image on the screen, and trip the flash in synchronism with the observed operational defect.

Extremely fast action can be caught with the Microflash, also made by General Radio. Duration of flash is 2 millionths of a second.

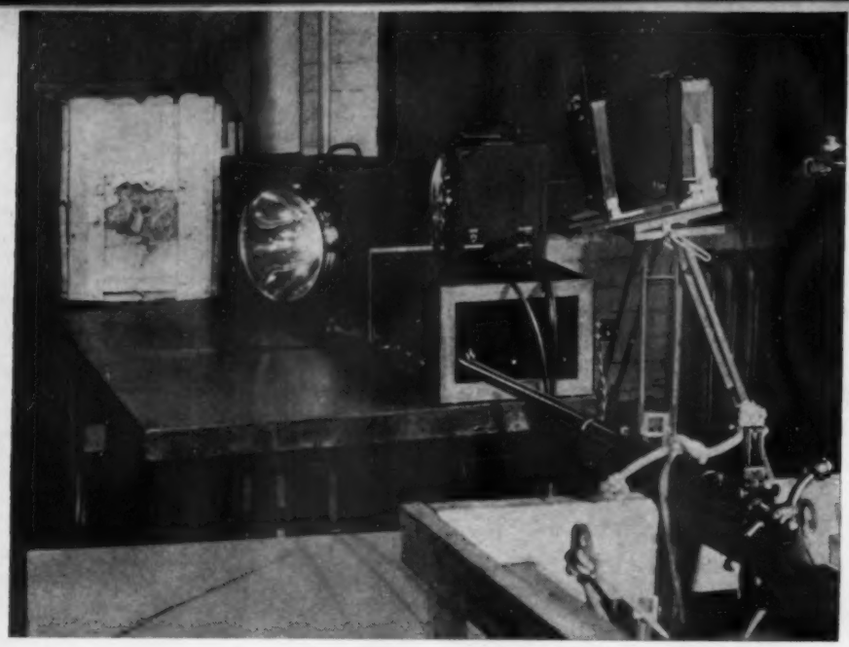
Multiple-Flash Technique—A sequence of non-repeating motions can be recorded on a single film, permitting a motion analysis (plot of displacement, velocity and acceleration). Flashing is controlled by a contactor.

High-Speed Motion Pictures—It is impossible to "stop" the action of modern machine tools and mechanisms with ordinary motion-picture cameras that expose 64 or 128 frames per sec. As a consequence, high-speed cameras that will operate at speeds up to 8000 frames per sec. are now made. Frame speed is not the only criterion in selection of a high-speed motion-picture camera; the shortness of exposure, which results in better definition, also has a bearing.

In high-speed cameras, a 100-ft. roll of film is used up in 1½ to 25 sec. This condition requires special means to expose the individual frames sharply and in register.

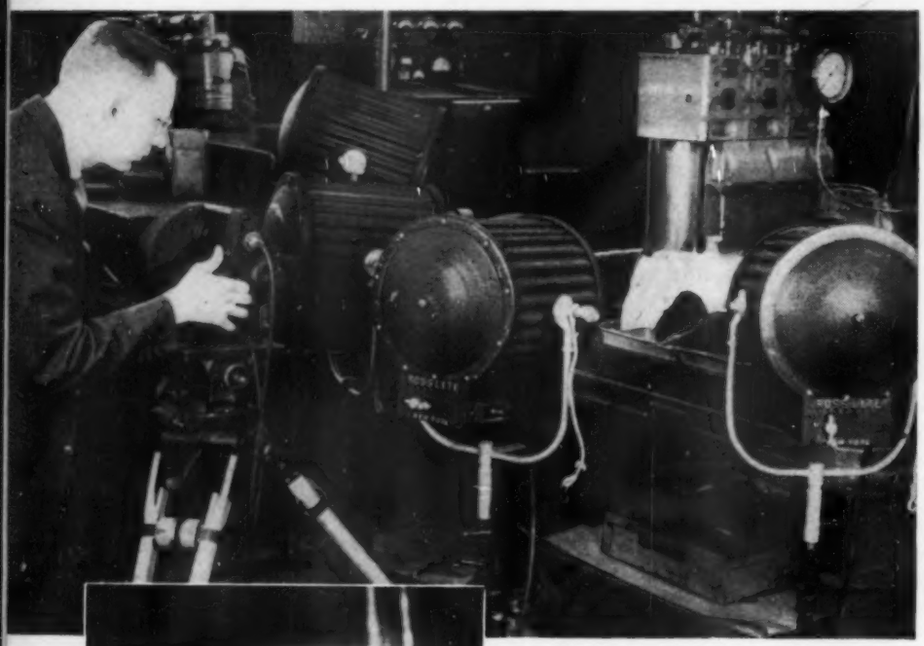
Camera Equipment—General Radio makes an electric 35-mm. camera which operates in conjunction with a stroboscopic light source. Pictures are taken at 500 to 1500 frames per second as the film moves continuously past an open lens aperture. Exposures are suitably framed for projection by a commutator on the camera sprocket to synchronize the rate of flashing with film travel. Effective focusing range is up to 10 ft.

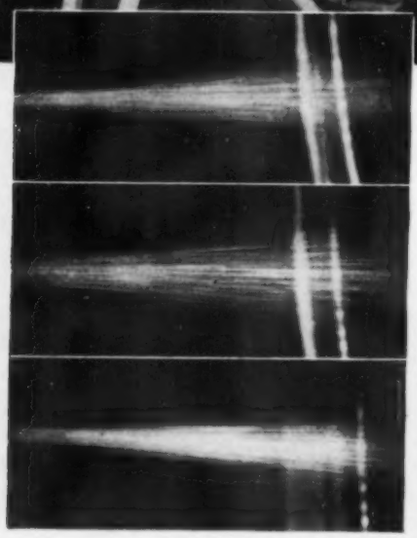
Crompton & Knowles Loom Works uses a high-speed stroboscopic camera of its own design. While this machine will expose up to 1200 frames per sec., most of the com-



BULLET PHOTOGRAPHY and studies of other fast-moving obects are handled with General Radio's stroboscopic equipment. The camera shutter is synchronized with the single flash by various methods

VALVE-SPRING action of gasoline and diesel engines is studied at the Experimental Laboratories of Mack Mfg. Corp., using a Fastax high-speed motion-picture camera. Powerful lighting is required

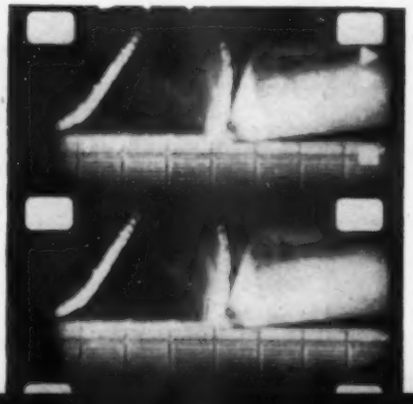




SAND-BLAST patterns (left) show that a new iron nozzle (top) wears in 3 hr. (center), but that 404 hr. does not hurt boron carbide (bottom)

COURTESY NORTON COMPANY

HIGH-SPEED motion-picture frames of chip formation at 65 sfpm.



pany's work is done at 400 frames per sec. Crompton & Knowles finds that clear definition is more important in its work than film speed, and use of the higher speeds unnecessarily multiplies the number of pictures. Exposure is 1/200,000 sec.

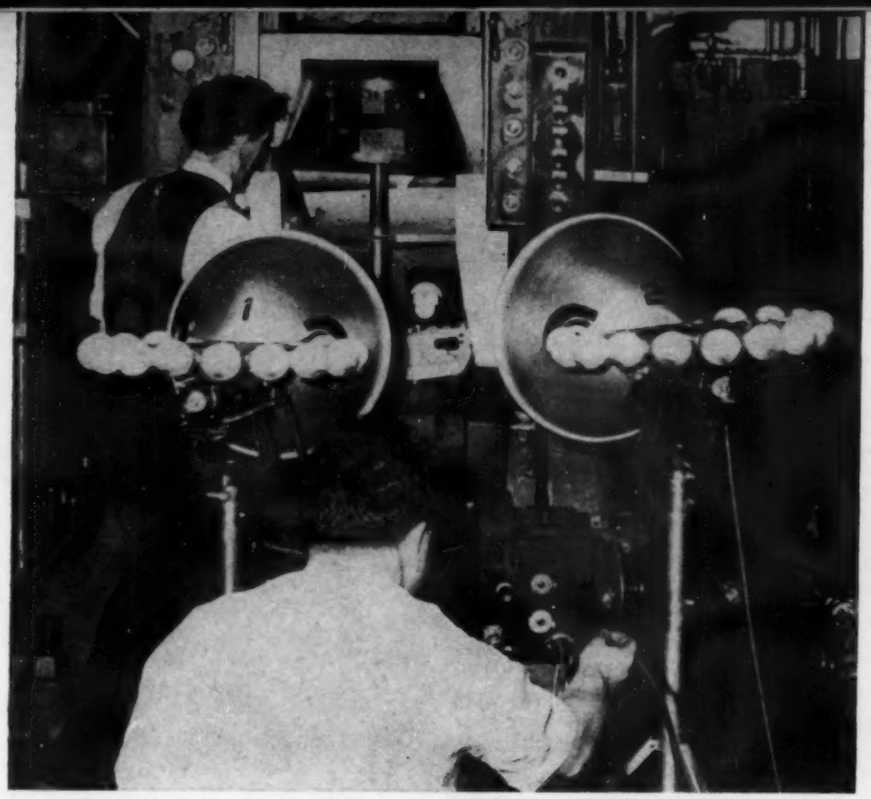
Non-Stroboscopic Cameras—Studies of mechanical motions, especially in the plant, may often be made with either the Eastman high-speed Camera Type III or the Western Electric Fastax camera. These power-driven machines require continuous illumination of the subject by means of photofloods, motion-picture focusing spotlights or sequence firing of a battery of flashlamps as in the technique employed by Henry M. Lester.

The Lester development is designed to overcome the objections of flood or soptlighting—heat which distorts fine mechanisms under testing and which annoys the photographer. As reported in *Photographic Age*, the Lester light source consists of a group of flashlamps mounted on the circumference of motor-driven rotor, which revolves horizontally through cut-out gates in a parabolic reflector. Lamps are fired in sequence at a rate that provides average illumination to expose black and white film and even color film, and for a time interval long enough to expose 75 ft. of film at proper camera speed. Operating costs for lamps and film are around $12 to $15 per reel.

Camera Operating Speeds

The Eastman high-speed camera Type III operates at 1000 to 3000 frames per sec. with exposure ranging between 1/5000th to 1/15000 sec. Film spools containing 50 to 100 ft. of Cine Kodak 16-mm. film, black and white, or color, are used. The film is continuously drawn through a gate by two sprockets. Since it is essential that the image formed by the lens remains stationary for exposure, the image is moved optically at the same speed as the film. This phenomenon is brought about by a rotating optical glass plate and shutter between the lens and film.

Western Electric's Fastax camera employs a rotating prism positioned between the lens and film driving sprocket. In effect, the image moves in synchronism with film travel to create successive, properly spaced frames. An argon glow lamp flashes 120 times per sec., and the light is projected onto the film edge as a marker for subsequent evaluation of elapsed time. Fastax cameras are



COURTESY ALUMINUM COMPANY OF AMERICA

FEW SECRETS remain in impact extrusion after photographing punch action and collapsible-tube formation with the Eastman high-speed camera Type III and Lester continuous flash illumination

made to handle three sizes of film:

Camera	Pictures per sec.	Exposure per frame	View Angle Deg.
8 mm.	300 to 8000	1/30,000 sec.	5½
16 mm.	150 to 4000	1/12,000 sec.	11¼
35 mm.	500 to 3500	1/12,000 sec.	40

Preparation of Subject—To make the specific items of interest stand out, paint them with water-white paint. Other areas in the scene may be painted in light-gray tones. A blackboard close behind the subject helps to silhouette the mechanism.

Timers—Commercial timers are made with 1/1000-sec. graduations for ease in calculating acceleration. Some of these timers are inadequate, the scale markings being too close together to be read easily on the projected film.

Projection—High-speed movies are projected at normal speeds, ordinarily 16 frames per sec. for an over-all check of what the film shows. Then individual frames are evaluated by running the film through a 16-mm. editing outfit or a Recordak or Diebold microfilm viewer (see microfilming section), the measurements are made, recorded on data sheets and detailed engineering computations made at leisure.

Motion Pictures Need Good Planning

INDUSTRY KNOWS the power of slide films and motion pictures to train workers and supervisors, instill safe working habits, create good will, stimulate suggestions, sell goods. But if the desired impression is to be created, the slide film or motion picture must be good. Inevitably, commercial films are compared with Hollywood movies. As a result, the production must be well done technically to avoid a bad, or negative, impression.

To avoid a flop, the slide film or motion picture must be planned. That sounds simple, but numerous failures show that management did not first work out a clear-cut set of objectives and that it failed to give adequate heed to the importance of script, acting, direction and other technical details. Pitfalls of this type can be avoided, as many hundreds of good productions show.

To avoid failure, management will find it helpful to have a copy of "New Horizons for Business Films," published by the Association of National Advertisers, Inc., 285 Madison Ave., New York 17, and priced at $7.50 per copy. This report, summarizes the experience of more than 60 companies with motion pictures of various types. A second "must" publication is "The Index of Training Films," published at 157 East Erie St., Chicago 11. Here are listed hundreds of slide films and motion pictures available on a rental and purchase basis.

Save for films designed primarily for showing in a company's own organization, the most important consideration in making any commercial motion picture is the question of distribution. Only after a sponsor knows how he plans to distribute his film is he in a position to consider costs.

Well-made commercial films will cost from $500 to $1000 per minute of projection time. The cost will be less if "done at home," providing there is someone in the company organization who has adequate knowledge of motion-picture technique. In any case, the cost must be related to the job the film is to do.

The slide film is the less expensive medium and is adequate for many purposes. A 35-mm. slide film may

COURTESY JAM HANDY ORGANIZATION

SUCCESSFUL motion pictures for training and commercial purposes are usually based on professional quality

cost from $500 to $3500 for an 11 to 15 min. show, depending on these factors: (a) silent or sound; (b) black-and-white or color; (c) use of extant material; (d) interior vs. exterior photography; and (e) inclusion of explanatory drawings.

Motion pictures of industrial or commercial subjects intended for audience showing are taken on either 16-mm. or 35-mm. film. The 16-mm. films are particularly suitable for in-plant photographic departments because the equipment required is more compact and less expensive than equipment of the Hollywood type. With 16-mm., too, color can be introduced at relatively minor extra expense. The 16-mm. Kodachrome Commercial Film has sufficient exposure latitude for in-plant conditions and is capable of producing release prints of high color quality.

Color has the advantage of lending a "three-dimensional" and more lifelike quality to most productions. Sound, which stimulates a second sense, also adds to "actuality." While any sound increases costs, a choice exists here between two types: dubbed sound, in which commentary and sound effects are recorded independently of the visual image; and "lipsynch," or synchronized sound, in which the sound is recorded simultaneously with the picture. The latter, understandably, is more expensive and requires a sound engineer and sound recording equipment.

Managements interested in making motion pictures should ask themselves if people on the payroll possess talent to write script, act, direct, time, make the picture and edit the film. If the organization lacks such personnel consult the "Directory of Principal Companies Engaged in Production of Industrial, Commercial and Educational Motion Pictures and Slide Films." This directory is available from J. E. Brulatour, Inc., with offices at Fort Lee, N. J., Chicago, and Hollywood. Commercial houses usually work with precision 16- or 35-mm. equipment, make prints on 16-mm. film, have at their command script writers, actors, directors and expert camera crews. If a commercial house is approached, ask to see what has been done for other clients, and if these films are satisfactory pull out a "film objective," or, plan of what you hope to accomplish.

The price quoted may range in the low hundreds per minute up to thousands. Cost rises in proportion to type of film:

1. Silent black and white.
2. Silent color.
3. Dubbed sound on black and white or color.
4. Lipsynch, or synchronized sound, black and white or color.
5. Animation to which sound and color can be added.

Backgrounds, travel, rehearsals, etc., increase cost. Anyway, it is a fair assumption that $1000 per min. will buy 16-mm. color, lipsynch, narration and musical background.

Motion Pictures in Time Study

For a good many years, motion pictures have been used in time and motion study and in motion analysis. And there is every reason to believe that their use will grow, despite union opposition where it exists, because manufacturers must bring costs down.

The camera records such studies for future reference. Any camera can be used but measurements are more easily interpreted if made in decimal parts of a minute. For example, Bell & Howell's Filmo-Electro 16-mm. camera runs at 1,000, 2,000 or 4,000 frames per min., and hence each frame represents an elapsed time of 1/1,000th, 1/3,000th or 1/4,000th min. The lens furnished has a wider angle of view than normally required with 16-mm. cameras, thus enabling a greater field to be photographed at the distance from camera to subject normally encountered in time study.

Since motion-study operations occur inside an industrial plant, artificial lights are needed. The number of lights depends on the operation being photographed and the ambient light level. One or two lights will usually suffice for a small area.

The developed film is projected at 800 to 1200 frames per min., thus slowing down photographed motion for a quick analysis or a group showing. The projector has a frame counter that can be set to zero at any time, to allow time consumed for any operation to be found by hand turning the series of pictures involved. And individual frames can be studied in a viewer, which advances the pictures one at a time by means of a hand crank. This allows each frame to be studied and measurements made.

"...Better Than 1000 Words"

Most people take still photographs for personal reasons, but overlook bread and butter applications. The equipment for doing a good job is not beyond the means of even small establishments.

Generally speaking, a 4 x 5 in. camera of the Speed Graphic type is the most useful for photographing machines of any size and taking publicity pictures. If the camera has a long bellows extension it will be possible to make excellent close-ups

TIME AND MOTION studies are made by filming action at speeds up to 4000 frames per min. with Bell & Howell's Filmo-Electro 16mm. motion-picture camera, and projecting in slow motion or a frame at a time

PICTORIAL operation sheets are more easily understood by machine and assembly operators; reduce training time, mistakes and spoiled work. Such sheets prove helpful in relations with sub-contractors

of parts and tools. In addition to the lens normally furnished, it is desirable to have wide-angle and longer focus lenses.

Smaller cameras can be used, also larger ones. A 2¼ x 3¼ or a 3¼ x 4¼ in. camera can be used for many photographs of setups and tools. Larger cameras, 5 x 7 and up, may also be used. Such outfits, however, are studio cameras and the need for them will depend chiefly on the scope of the photographic project.

A synchronized flashlamp attachment with a side light is a good accessory. Three floodlamps on tripods and of 500-watt capacity or more will help to get sharp pictures when flash lighting is not essential. A high-quality tripod to hold the camera steady is a necessity.

Equipment for a modest darkroom, providing developing, contact printing and enlarging facilities, may be installed for $400 or so.

Uses for Still Photographs

1. To train machine operators. Pictures of the operation supplied with the operation sheet overcome lack of abiilty to read blueprints.

2. To record details of setups, save time in next setup.

3. To guide assembly operators. Many plants are continuing the wartime practice of providing exploded views and special photographic layouts of the work to be performed at a specific station.

4. To record the tools and fixtures needed for a specific job, as an aid to tool cribs.

5. Photographs with part numbers are easier for the average operator to understand than prints.

6. To inform sub-contractors by supplying operation and part photographs in addition to operation sheets and blueprints.

7. Photographic records of a new machine during the course of erection and at a time of shipment are of value to the advertising, engineering and sales departments.

8. If broken parts and tools are photographed, designers and process engineers have records which assist in re-design.

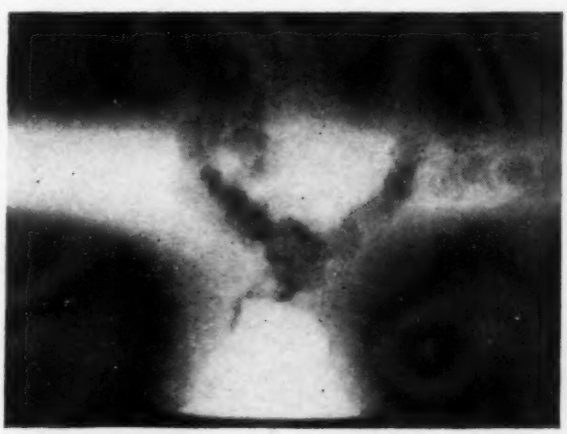
Non-Destructive Tests Require Film

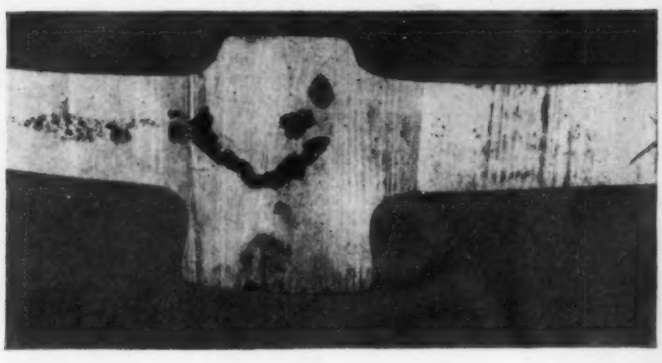
Photography is essential in all forms of radiographic inspection and it is a desirable adjunct to inspection with supersonic and magnetic-analysis equipment.

Internal defects in welds, castings, forgings and plastics are located and measured with X-ray machines or radium capsules. X-radiation and gamma-ray radiation (radium) are invisible forms of energy, but expose special types of photographic films. Hence the selected film is placed behind the object, radiation is applied by proper technique and a shadowy picture is recorded on the negative. The developed negative is placed on an illuminated screen or reader, and voids, cracks and holes are seen as darker areas in the film.

Since 1939, the development of suitable X-ray generators and betatrons has gone on apace, as has development of photographic films of several types to handle almost any radiographic-inspection problem. Techniques and film characteristics were described in detail in *American Machinist's* special report on "Non-Destructive Testing Methods." Reference should also be made to "Radiography in Modern Industry," published by the Eastman Kodak Company; price $3.

Radiography must be practiced with adequate safeguards for personnel. For handling occasional jobs, radium capsules can be rented or a commercial testing laboratory can handle X-ray jobs. But when enough work is X-rayed, either for process development or spot inspection, consideration should be given to establishing a radiographic department complete with layout areas where films can be applied to bulky parts, an X-ray room, a control room and a film-development and film-





RADIOGRAPHY proves, without need for destroying a part, whether is is sound. Left—Shrinkage and cold shuts in an aluminum casting as shown by X-ray. Right—Casting sectioned to prove the point. Studies like this aid process development

COURTESY OF GENERAL ELECTRIC X-RAY CORP.

reading room. The department can be made to function on a production basis.

X-ray diffraction tests also depend upon the camera. An X-ray beam is passed through a sample of the material and the rays are bent by the crystals into a series of emergent rays whose separation and intensities are characteristic of the material and its prior treatment. As in spectroscopy, the material is thus "fingerprinted," with the extra feature that the pre-treatment can be identified and the probable further behavior by future treatment can be predicted. Exposure times range from 10 min. to 4 hr., depending on the structure and analysis. Plate film and strip film are used, according to the type of camera and technique employed.

The cathode-ray screen is used for an indicating means with Sperry Reflectoscope supersonic inspection equipment and DuMont Cyclograph and Ferrograph magnetic-analysis machines. Visual examination of the screen pattern is sufficient in many cases; in others it is desirable to record the test results or to set up a standard pattern for acceptable pieces. With the Reflectoscope, a photograph of the screen pattern will record indications of sub-surface porosity, discontinuities or other structural defects in the part. Photographs can be taken with a view-type camera on a tripod mount affixed to the inspection machine, and by using a black screen curtain to shut out room light. Or a conical light shield can be made and mounted over the screen and a Kodak 35-mm. camera or Leica camera mounted over the opening in the small end of the cone. Similar setups can be used for the magnetic-analysis equipment in order to record the Lissajous indications of acceptable and non-acceptable material for comparison purposes when a batch of parts is being checked.

Cathode-ray screens are blue or green; the non-recurrent or transient traces occur at high writing speeds. These conditions require supplementary lenses to permit taking photographs at short distances and film with correct speed and color sensitivity.

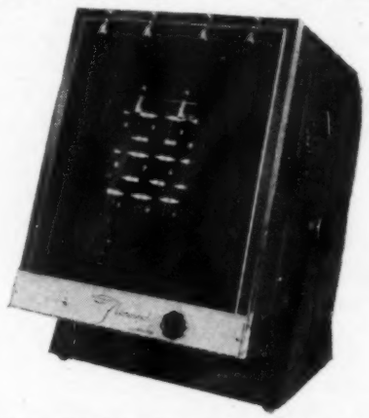
In the future, it is probable that purchasers of high-quality, or strict-specification material, will accept photographs of cathode-ray screen indications as sufficient evidence of products free of invisible, harmful defects, or of correct analysis, or of proper heat-treatment, as the case may be.

X-RAY DIFFRACTION is currently used for routine checking of incoming materials (as at M. W. Kellogg Co.) Four cameras on this North American Phillips machine allow several investigations at once

Photography Records Flaws In Metals

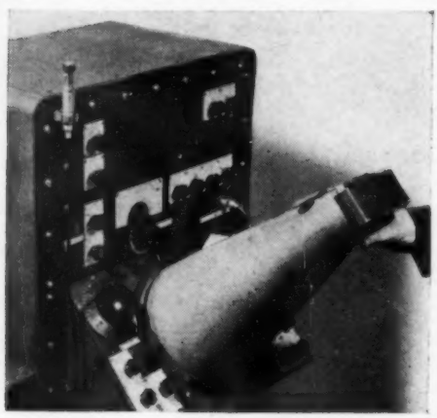
An important phase of quality control is to avoid using defective or off-specification material and to learn the reasons for flaws and failures when they do occur. For example, the part may be studied with a powerful shop microscope and an almost invisible hairline crack found. By photography, the eye piece image can be recorded, together with the width of the crack as measured by the scale on the eyepiece.

Photomicrographs—Metallographic examination of the defective area is the next logical step. The specimen is prepared, suitably mounted and put on the stage of a metallograph. Three kinds of illumination are possible with this equipment—bright field, which reveals the structure of the metal; dark field which will show whether the suspected fault is a ridge or a crack, and



X-RAY NEGATIVES are read best by placing them on an illuminated screen, as in this Westinghouse equipment designed for the purpose

INDICATIONS on the cathode-ray screen of the Sperry supersonic equipment are photographed after placing a light cone in position



polarized light, which permits analysis of crystals and inclusions by color.

After visual examination of the specimen, the metallographer may elect to make a photomicrograph for record purposes and further study. This can be done with the camera, which is part of the equipment. Ordinarily, plates like Eastman D-72 are used for bright-field work because the emulsion is fine-grained and gives high contrast. The D-76 emulsion, a lower-contrast type, is better suited to photographing specimens illuminated by dark field or polarized light. Color photography has been applied lately to making photomicrographs under polarized light. The advantages are worthwhile, particularly in research work, because more positive identification of inclusions and structure is made possible.

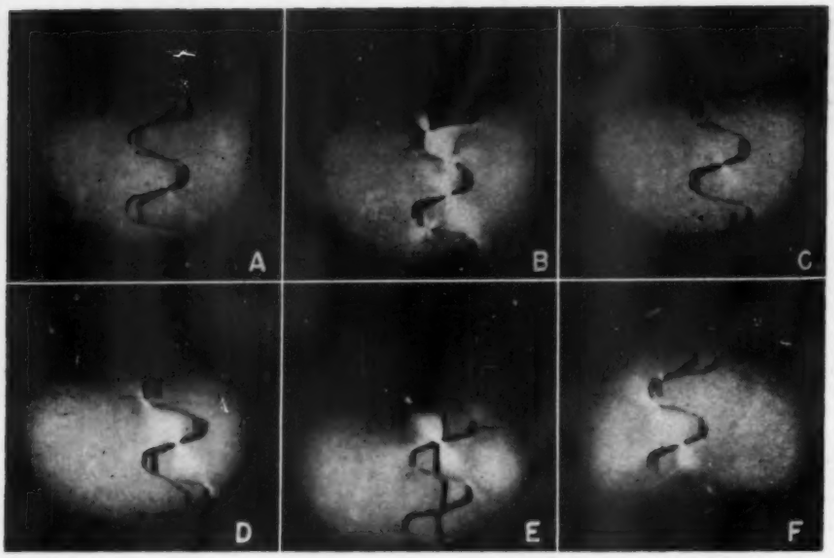
Perhaps it is just as well to start off a metallurgical inspection department with a simple metallograph (made for bright-field work only). This equipment costs a few hundred dollars, enables routine checks on samples to be made. With experience in this class of control work, and when research projects are evidently needed in order to answer certain production or development problems, it will be time to consider purchase of the more costly research machine which incorporates all forms of specimen illumination — bright field, dark field, polarized light and tinted polarized light. The last enables separation of optically active constituents with close color values.

Microradiography—Minute voids and cracks and the distribution of chemical constitutents in a metal structure are revealed by microradiography. In this technique a thin specimen is ground and polished similar to methods for making metallographic specimens. An X-ray beam is passed through the specimen to expose a special emulsion in contact with the under surface. Studies of machinability have been made by this process: for example leaded brass. Here the method disclosed the shape and distribution of the lead particles. Studies of inclusions giving rise to machining troubles with other materials have definitely revealed the composition of the foreign matter, thus enabling technicians to trace origin of the impurities.

Metal Analysis — Spectrographic examination of metals reveals their chemical analysis within close percentages. A sample is ignited by an arc or by sparking and the emitted light is recorded on special photographic plates. Since each chemical element gives off spectrum lines that always occur at the same locations in the spectrum, the material is "fingerprinted" by spectrosopy. After exposure and development of the plate, the spectrographer reads the density of the lines with a microphotometer to estimate the percentage of the element. Since spectrographic equipment is expensive, firms having occasional use for this materials-analysis method would do well to consult a commercial testing laboratory.

SPECTRUM LINES emitted from a burning sample are recorded on special glass plates, which are evaluated for metallic constitutents and impurities. This Bausch & Lomb spectrograph is used in research

PHOTOMICROGRAPHS are being more widely used to interpret shop problems in relation to metal structures. Research metallographs, like this Bausch & Lomb instrument, fit plant needs after experience



STRESSES arising in gear teeth through various errors in geometry were demonstrated by Fellows Gear Shaper Co., by taking motion pictures of plastic gears under polarized light

A. Accurate gears are denoted by small and identical points of contact (white areas).

B. Eccentricity produces wedging of the teeth and high localized stresses, as compared with the situation at A.

C. Variations in tooth spacing throw the load on one tooth.

D. Lack of conjugate action, arising from different pressure angles, causes incomplete profile contact.

E. Lack of continuous action, produced by shortened teeth, prevents uniform velocity, causes vibration at high speeds.

F. Fillet interference concentrates stress at the root, interrupts involute action, is a source of noise.

Photography in Stress Analysis

FILM RECORDS can be used to advantage in two methods for checking the location of stresses in various parts and mechanisms: (1) photoelastic stress analysis and (2) application of a brittle lacquer like Stresscoat (made by Magnaflux Corp., Chicago). Photographs aid in evaluation of the stress patterns revealed by these testing methods.

Photoelastic stress analysis has been used for years, principally by larger companies and research laboratories. Presently, there is no reason why the method can not be used by small shops, because the plastic is now relatively cheap and related equipment need not be expensive. In this testing procedure, a model is made of suitable clear plastic and subjected to loads proportional to those predicted in service. Polarized light is passed through the plastic model and viewed in a suitable polariscope. The pattern of light and dark bands seen indicates the location, magnitude and direction of stresses. Stress concentrations in keyways, notches, gear teeth may be discovered. Regions of low stress are seen, aiding weight reduction.

Both still pictures and motion pictures of photoelastic studies can be made. In the case of gearing (illustrated above), the gear train was placed between two pieces of laminated Polaroid. Light from an inclosed source was passed through the first polarizer, the plastic gears, and the second polarizer (rotated to best show stresses) and finally into the lens of the 16-mm. motion picture camera. Exposure was a matter of trial and error. But when projected on the screen, the film study made plain to gear men certain points that had been matters of conjecture.

REPRINTS of this report are available at a charge of 25¢ each to cover the cost of handling and mailing. Address orders to Readers Service Dept., American Machinist, 330 West 42nd Street, New York 18, N. Y.

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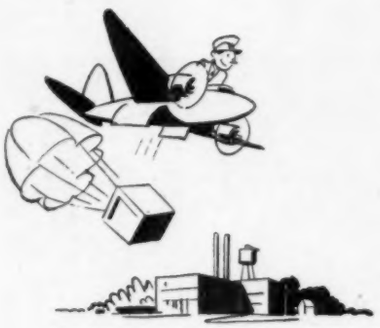
TALKING SHOP



Air Delivery

ALERT COMPANIES manufacturing small parts are making sure of air facilities these days. As a case in point, Tinnerman Products recently prevented a shutdown at the Guide Lamp Division of G.M. in Anderson, Ind., by shipping 100,000 speed nuts from Cleveland by air. The nuts were finished at 3:15 P.M., and flown to Anderson by Executive Airlines. That 80-lb. shipment would have left 200 workers idle if it hadn't been delivered by 6 P.M.

Too Pure

DURING THE WAR, North-American Phillips was mystified by rejection of silver wire, annealed at 0.020-in. dia., then drawn to 0.002-in. dia. to make it hard (for silver) with an elongation of 10%. The customer reported the wire dead-soft (40-50% elongation) at random spots in the coil. Detailed checking showed no mishandling or re-annealing. Finally the metallurgists found the answer—the wire was something over 99.999% pure silver, hence was self-annealing in three days to dead soft. Changing to 99.8% pure (the specification) solved the trouble.

Stainless Reputation

A CHIEF ENGINEER who has had to do with processing and application of a variety of metals during his forty years in industry says: "Stainless steel may not be a cure-all, but it certainly has less wrong with it than any metal I've known. Heavier machinery is necessary to fabricate it, but less supplementary equipment is needed to make up for any deficiencies. It costs more, but a little goes a long way."

Better Man

WE RECENTLY MENTIONED that induction heating installed in one forging plant saved 1½ men, but required a specially trained man. One reader points out, and rightly, that we didn't clearly say that hi-frequency installations require no more *operating* skill than do more familiar ones. But the *maintenance* man must be better. The maintenance department today must include at least one trained electrician anyhow, and hi-frequency equipment usually is accompanied by blueprints the electrician can read as easily as an operator reads a part blueprint. More importantly, cost per piece goes down as production rate goes up.

Little Brake Needed

TOP PRODUCTION MAN in a big railway-car shop says 15% of all bending and forming work in his press-brake department could be done on a brake with a bed 1 ft. wide. He thinks there should be an excellent market for such a size, for many shops have a higher percentage of small work than his company. He feels sure such a design could be worked out economically — and would avoid present necessity of setting up jobs on a 4- or 6-ft. brake.

Equipment No Limitation

AVAILABLE press sizes and capacities are not the main limiting factors in progress of powder metallurgy, say a number of authorities. They claim that press capacity is adequate but that the cost of large punches and dies and insufficient current tooling technology are definite limitations. Subsequent sintering cost of large press-metal parts is also a problem. Rapid progress is being made in development of more complex die construction for such parts as belt buckles, with satisfactory sintering results.

Hot Stuff

DEUTSCH COMPANY, Los Angeles, reports faster soldering by heating valve bodies with infrared. Bodies are loaded on a conveyor that carries them under the lamp bank. Solder is applied as the bodies emerge.

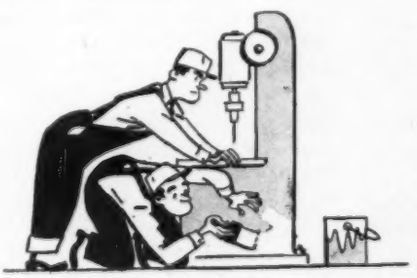
Another tricky heating unit is the 5-kw. "Radarange"—which cooks a bacon and egg sandwich in 15 sec. or heats a doughnut in 2 or 3 sec. in a 13 x 14-in. oven. Raytheon rents the range at $5 a day. Radar waves are very short, so can be beamed like light, go right through glass, and are absorbed by non-metals. This method is claimed more flexible than dielectric heating, so may do core baking and preform heating.

Shipping Short Orders

OIL COMPANIES are now short-shipping orders of industrial oils, which include lubricants, hydraulic oils, cutting oils and quenching oils. Demand, contrary to expectations, has not fallen off, and is more than taxing war-increased capacity of the industry. What tripped up the prognosticators was the sharp rise in demand for motor oils when gasoline restrictions came off. (Motor oils are produced by the industrial-oil divisions.) Increase in use of hydraulic equipment and modernized lubrication programs account for a considerable increase over pre-war demands. New distillation capacity will increase supply of industrial oils by 15%, and is expected to take care of potential demand.

Constant Color

USUAL "good shop" painting procedure is to repaint every year or two. In one plant with functional color painting of walls and machines, however, paint depots are spotted strategically, and paint and brush are within reach of any operator at all times. The result is machines which look constantly as if they had just been painted—which they usually have. And the effect on morale is reported tops.



Preventive Measures Reduce Welder Upkeep

BY C. A. LEHTON AND H. F. WORCESTER
ELECTRICAL MAINTENANCE DEPARTMENT, RYAN AERONAUTICAL COMPANY

Periodic inspection of welders and anticipation of recurring failures enable minor repairs and replacements to keep units in operation longer and cheaper

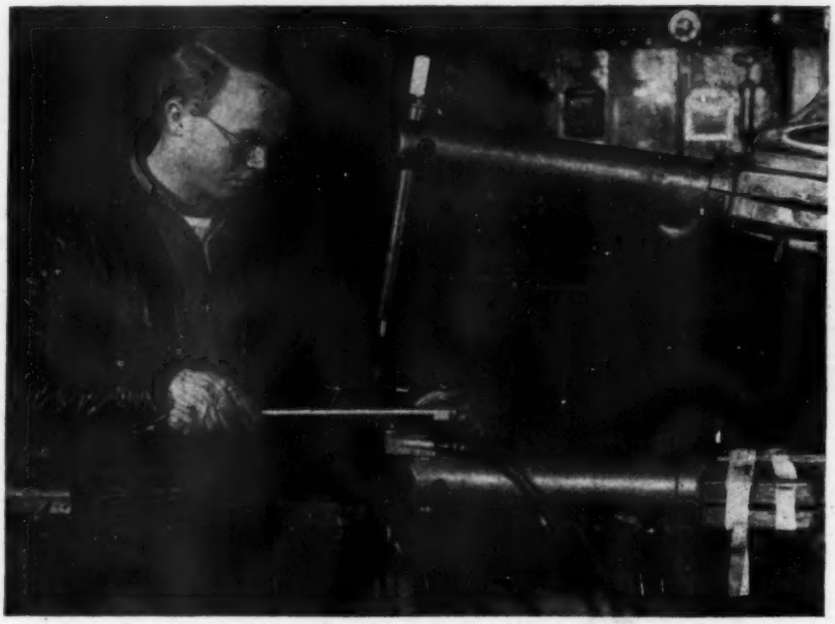
PREVENTIVE maintenance, handled on a systematic basis, has cut welding-machine upkeep by a third and sharply reduced downtime at Ryan Aeronautical Company. The Electrical Maintenance group, working under Plant Engineering direction, is charged with keeping 75 electrical welding machines in continuous operation. Secret of their successful program is to repair and replace before a defect reaches large proportions..

General practice is to remove each welding machine to the electrical shop for overhaul and renewal of wiring once a year. However, preventive maintenance on the floor has enabled many machines to be kept in operation for more than two years without general overhaul.

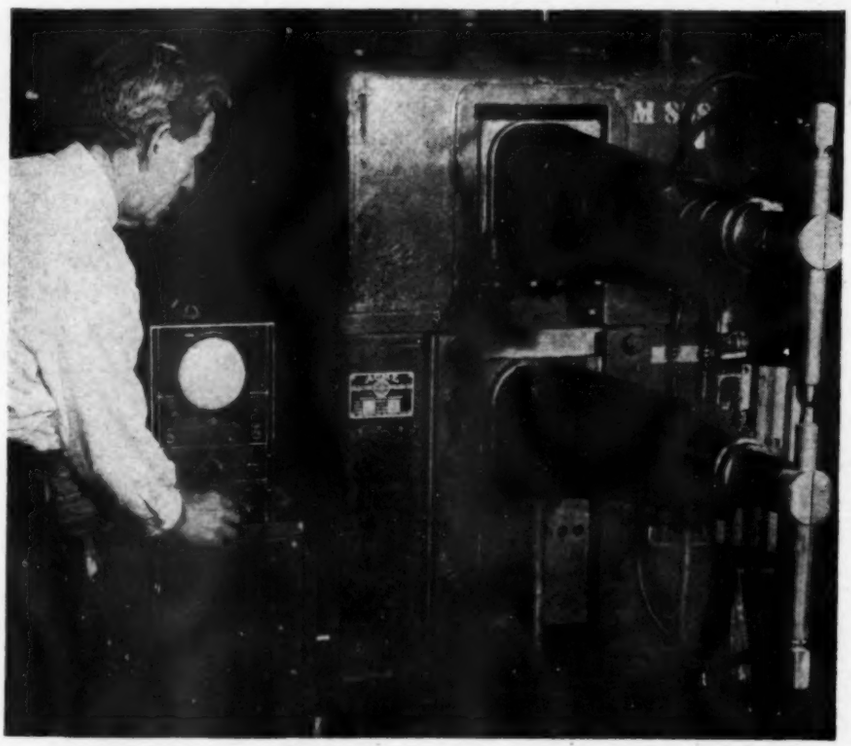
Subassemblies which must be finished by grinding subject the welding machines to an added dust hazard. Spotwelders, with delicate control and timing devices, are particularly susceptible even though housed in sealed or filtered cabinets. Such housings are wiped with clean rags and air blasted at least once a week.

Heavy loads imposed on sequence and timing controls by production welding rates as high as 130 spots a minute gives an effective life of about a week or less on such vital parts as contacts and bellows. Failure to anticipate this may result in downtime of anywhere from two hours to two days, depending on availability of parts.

Maintenance of controls for the 25 production spotwelders in the Ryan plant is a major requirement, and types of control range from the purely mechanical or pneumatic through

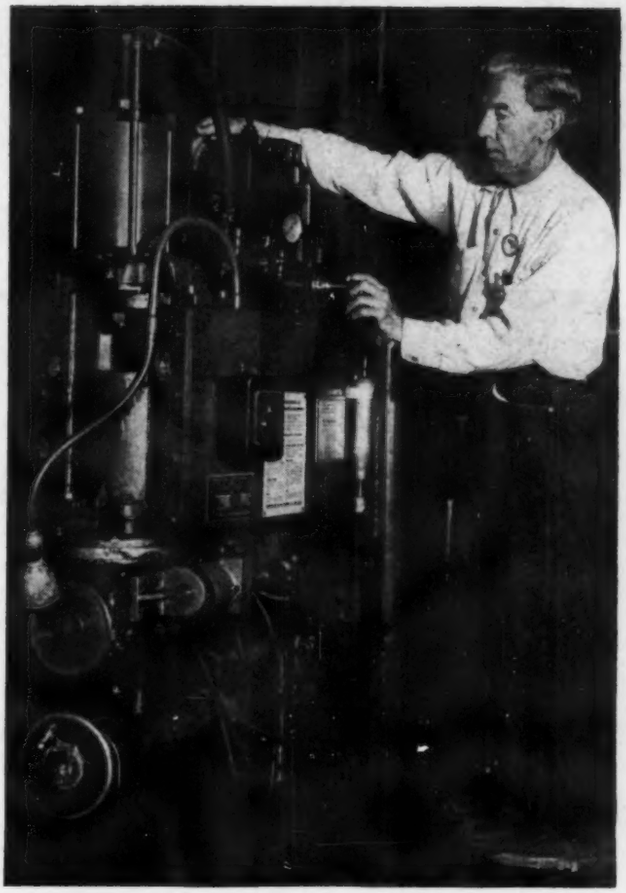


Copper electrodes on spot welders are dressed with emery cloth to remove all traces of oil, oxides and dirt which might impede the flow of current, as one of the preventive maintenance measures on Ryan welding machines



Timing cycle and current amplitude of all Ryan spotwelding machines are checked by oscillograph once a week or more

Control cabinets, although sealed, are susceptible to process dust which must be removed, as in this measured-capacity type which regulates current flow



Routine inspection on Ryan seamwelders includes a check of the Ross valve to see that proper air pressure is available for actuating the upper welding electrode

various combinations of completely electronic. Prompt and careful replacement of malfunctioning units keeps machines functioning and parts are stored adjacent to the equipment.

Pneumatic cylinders, with which many of these machines are equipped, have air valves checked at least twice a week for leaks. Lubrication is checked at the same time. Neoprene instead of leather for packing has substantially reduced maintenance and inspection cost.

Spotwelders, installed throughout the plant, draw relatively large currents and the machines in each group are interlocked to eliminate simultaneous operation and peaking of load. This reduces maintenance cost if the efficiency of the interlocks is maintained by weekly checking.

Burned rheostat contacts is the most frequently recurring trouble in arc-welder maintenance. Standard maintenance practice requires a general inspection of these machines once a month and includes checking the brushes and switches.

A record of work scheduled and performed on each machine is kept in a 2-part loose-leaf form. The first part of this individual machine record is a 4½x11-in. cardboard strip, overlying the 8½x11-in. sheet or second part. Space for entering a complete list of scheduled work and operation-frequency is provided on the cardboard strip. On the exposed (right) half of the underlying full sheet there are columns in which the completion of each operation is checked off, allowing complete notations for 13 weeks.

Plant Engineering distributes these forms to the various supervisors of maintenance departments, electrical, mechanical and carpenter shop. They are then given to inspectors who make the inspection and repairs noted on the forms and return the forms to the supervisors for checking and filing.

If inspection discloses that a major overhaul or repair is necessary the mechanic writes out a special request to the supervisor.

Lubrication of equipment, including electrical welding machines, is scheduled and performed in accordance with card instructions furnished by a major oil company and printed to Ryan specifications on each unit. A white card is used for the Plant Engineering department and a tan card for the Electrical Maintenance files, for a month's operation.

Check Fire Extinguishers

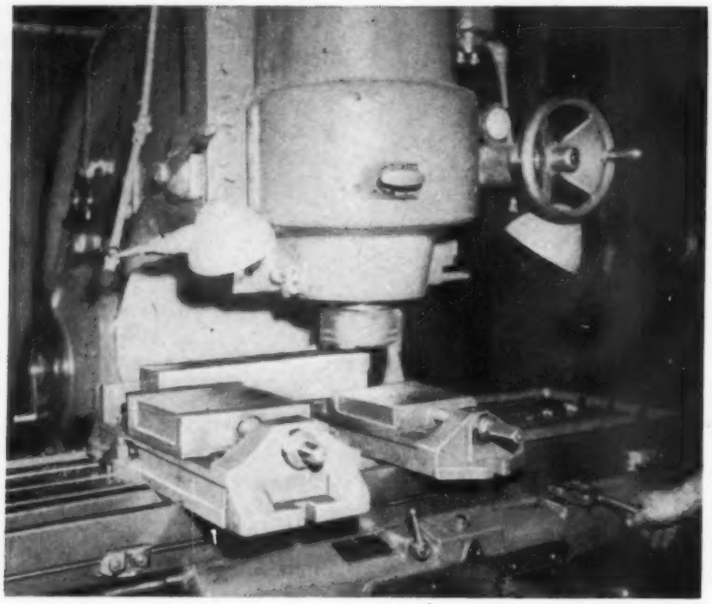
Government release of surplus fire extinguishers brings a warning from the Safety Research Institute.

Extinguishers bearing the label "EAS," are substandard devices manufactured during the shortage of critical materials. Emergency extinguishers, approved by the Underwriters' and Factory Mutual Laboratories, now may be unserviceable.

Other equipment released as surplus, though standard, may now be dangerous to use because of mishandling or improper maintenance. Dents, bulges, signs of corrosion, and evidence of repairs should be checked by the manufacturer.

How to Specify

MACHINE TOOLS FOR CARBIDES..3



BY H. A. FROMMELT, CONSULTING ENGINEER

Power requirements, separate spindle drives, automatic feed changes, number and adjustment of spindles, flywheel effect and work handling should determine milling-machine specifications

This vertical milling machine, equipped with flywheel, electrical braking, 50-hp. spindle drive and 5-hp. table drive, has been operated well above normal rating over considerable periods with no damage to machine

SPECIFYING machine tools for carbides, as we have already seen in previous discussions, requires an entirely new approach on the part of management.

Limitations in cutting materials, for all practical purposes, have been removed. Machine-tool manufacturers can build any size of machine, within limitations dictated by manufacturing economies. The only remaining limits are, as already discussed, those inherent in the workpiece: cross-sectional thicknesses, ribbing, and ability to be held rigidly and securely.

There remain then to be treated the considerations of machine-tool design that are called for by the technique of carbide machining. The present discussion will consider the more obvious of these specifications, particularly as applying to milling equipment.

It does not seem likely, except in extremely rare instances, that more than 50 hp. per spindle will ever be justified, although 100 hp. is no doubt feasible from the machine-tool builder's standpoint.

Fifty horsepower with carbide tooling makes possible the removal of 100 cu. in. of normal steel, such as SAE 1020 of 160-180 Brinell and 150 cu. in. of 25,000- to 30,000-psi. cast iron per minute. Except for some large components, turbine casings or diesel-engine bases, neither the component nor the overall economics of manufacturing justify higher powered spindles.

Either the workpiece will not permit such exceptionally high metal-removal rates or the handling time, particularly for large components, is so much greater than the cutting time that the economies of higher rates are not justified.

Handling Time vs. Power

Large weldments, for example, can stand up to a removal rate of 200 cu. in. per min., using therefore 100 hp. on the spindle. But neither the volume of such orders nor the floor-to-floor time, which can be little influenced by the higher feed rates, justifies application of more than 50 hp. per spindle.

Where several or more cuts can be taken simultaneously, that is, in one pass, a multi-spindle machine should be specified with a minimum of 50 hp. on each spindle, separately driven. Metal-removal rates now possible no longer justify a single-motor-driven, multi-spindle machine.

Large planer-type milling machines, with one motor driving several or more spindles through spline shafting and gears, operate satisfactorily at removal rates possible with high-speed steel cutters. Machines for carbide use should be specified with a motor drive direct to each spindle. Otherwise, power losses alone to the several spindles, to say nothing of vibration and distortion in columns and cross-rails, may be excessive.

Centralized pendant control is quite essential to reaping fully the benefits of these newer techniques. This is especially necessary when taking the first cut on large castings. The uneven character of the surface, varying as much as 0.250 to 0.500 in., calls for a simple method of changing the feed rate as the volume of metal to be removed changes.

On approaching a projection, the feed rate should be easily and quickly decreased without other operating change in the machine tool. On approaching a valley, it should just as easily be increased.

The time is not far distant when machine-tool builders will make it

possible to remove practically a constant volume of metal, or to consume a constant and pre-determined horepower, by building into the equipment automatic feed changes. Relays will vary the feed rate to maintain a constant and pre-determined output of power from the spindle.

Multi-Spindle Machines

The specification and purchase of multi-spindle machines should be given serious consideration, as the apparent economies of taking more than one cut or of milling several surfaces in one pass may be misleading.

There is little question that for components such as machine-tool and diesel-engine bases, large turbine housings and gear casings, the multi-spindle machine with each spindle separately and adequately powered is the correct specification. The handling time for these workpieces is such that the time required to tool several spindles is justified.

Moreover, the disadvantages of multi-spindle operation, such as unequal wear of cutters, can readily and economically be absorbed. The handling cycle in larger milling jobs will always be considerably longer than the cutting, particulary with the newer metal-cutting techniques.

Ordinary operations that in the past have always been considered "naturals" for duplex milling should now be given careful study. Such operations that have justified duplexing were performed on smaller workpieces, the handling cycle of which could be reasonably reduced.

Economy Dictates Selection

Assuming at the outset that the duplex machine has each spindle driven by a separate motor and is otherwise adequate for the higher metal-removal rates, caution should still be exercised in approaching the solution. For instance, a single high-powered spindle, with fixturizing permitting quick reversal of the piece, may be more economical and should be given careful study.

Each job requires analysis and will yield the correct answer *if all factors are taken into consideration*. These include lower first cost of equipment, possible lower maintenance and higher over-all cutter life or pieces between grinds. This latter factor particularly is to be given full study, as no two cutters working simultaneously wear equally and down-time of a machine is determined by cutter life.

The greater ease and simplicity of handling and the possible time saving, along with reduced fixturizing costs, may easily tip the scales in favor of a single-spindle machine. This is likely when the same side of two similar pieces is being milled in one pass. Using the older technique this is good practice, but analysis of such an operation may show that it can be performed more economically with a single high-powered spindle and carbide cutters.

Flywheel Effective

A flywheel should be specified, either as built-in or its effect provided by a bull gear of sufficient diameter to meet this requirement. A carry-over effect is necessary with the coarser tooth pitches used in carbide mills.

An 8-in. cutter in high-speed steel is usually designed for approximately twenty teeth, whereas in carbide the prevailing designs seldom exceed ten and many use no more than eight teeth. This is particularly true of mills designed for the machining of steel.

An example will make clear the reason for this change in tooth pitch, the effects of which are far-reaching. Assume that a 5-in. wide face is to be milled with an 8-in. cutter and that this mill has twenty carbide blades or tips.

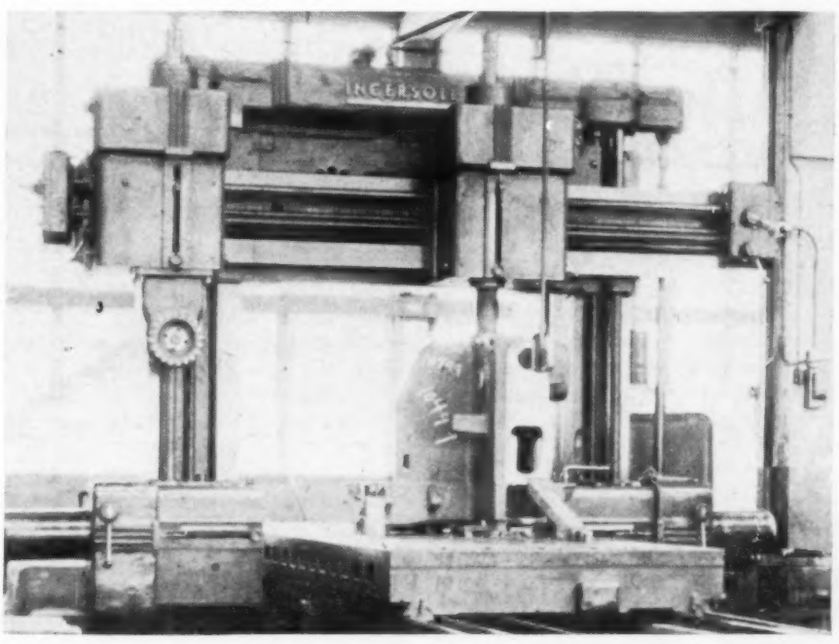
As it is not considered good practice to go below 0.010-in. tooth load for carbide, the cutter will then call for 0.200-in. feed per revolution. With a cutting speed of 500 sfpm., the spindle speed will be approximately 240 rpm. Thus, the feed rate will be 48 ipm.

If a cut 0.200 in. deep is to be taken, the cross-sectional area is 1 sq. in. and the metal-removal rate will be 48 cu. in. per min. This will require 25 hp. net at the spindle, and therefore 30 hp. gross. If the depth of cut is increased, as is frequently necessary, power requirements mount steadily to 50 hp.

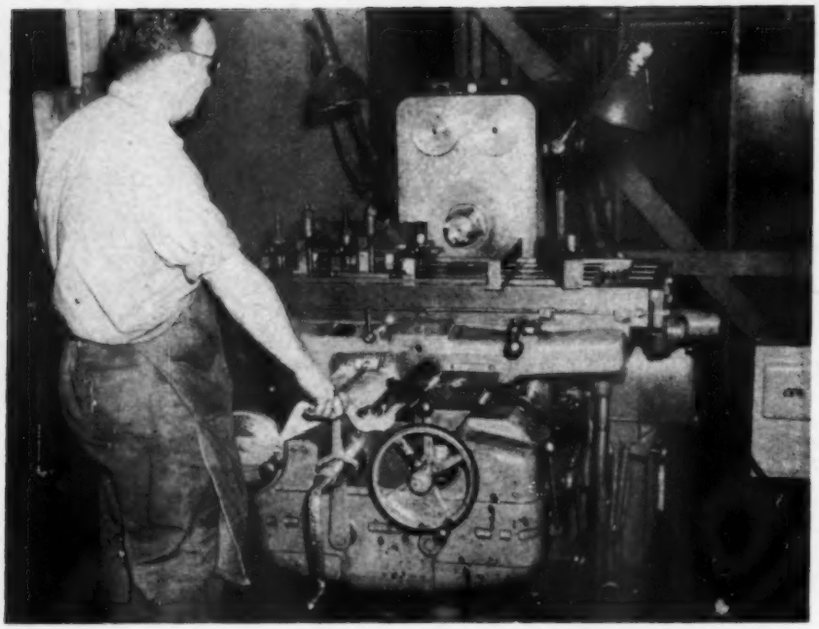
Machines of standard design now available would not qualify, even in major part, for this job. Some of the machine tools that have been especially designed for carbide machining, at least in the larger sizes, would be adequate. But a 5-in. face is comparatively small, and as soon as the width increases, the power goes up proportionately.

Thus, if an 8-in. surface is to be milled, then the power requirements, with the same conditions, will be based on a metal-removal rate of 76.8 cu. in. per min. Increasing the width of face to be milled results in excessively high horsepowers in relation to the other operating characteristics of the setup.

Furthermore, this ignores the important fact that the larger number of teeth for steel milling is impractical for most jobs because of insufficient space between teeth to accommodate chips. At higher cutting speeds, averaging about 500 sfpm. for



Planer-type milling machines for carbides should be specified with motor drive direct to each spindle to reduce power losses and vibration and with centralized pendant control for quick feed-rate change



This horizontal milling machine is equipped with a 16-in., 340-lb. flywheel for storing energy and releasing it between teeth engagements to lessen impact and smooth the operation

steel, the space between teeth, sometimes referred to as the "chip accommodation space" must be considerably larger than for the slower rates used with the older techniques.

The necessary coarser tooth pitch in turn calls for some carryover effect in the mechanism when only one tooth is engaged at a given instant in the workpiece. Even when more than one tooth is engaged at one time, the provision of flywheel effect is advantageous, especially to the machine tool, its life and upkeep, by releasing enough energy between the exit of one tooth and the entrance of the next to soften the impact blow and smooth out the operating character of the cut.

Flywheels in New Machines

Flywheels should be considered essential, at least in setting up specifications for new equipment. This is particularly true of knee- and column-type machines. Standard equipment can be operated either without flywheels, in a satisfactorily restricted manner, or with a flywheel attached to the spindle or arbor.

In large bed- or planer-type milling machines, the bull gear is usually large enough to make unnecessary the inclusion of a builtin flywheel. If the bull gear is being used as a flywheel, then at no time should a cutter larger than it be attached to the spindle, whether or not the bull gear is engaged through all ranges of spindle speeds. Otherwise, the flywheel effect of the cutter is greater than the flywheel effect of the gear, causing play or backlash in the gear train with every tooth exit and entrance.

Cutter Size

There is little reason, if any, for using cutters larger than 10 to 12 in. under any circumstances, regardless of the width of the face to be milled. Present techniques call for taking several or more cuts, matching them as can be done on properly designed and constructed machine tools, and taking these narrower cuts at higher feed rates. The over-all time is no greater than that with a large diameter cutter, the re-conditioning of which increases approximately as the square of the diameter.

But flywheel effect means stored energy that must be accounted for in the operation of the machine, particularly in the deceleration cycles. When the spindle is to be stopped, this additional and stored energy must be absorbed. Mechanical brakes only are no longer considered adequate.

Electrical braking is more effective for stopping spindle rotation. The motor leads are reversed, tending to reverse the direction of rotation of the driving motor. This makes possible almost split-second stopping.

If standard equipment is being used in a carbide conversion program, the inclusion or addition of a flywheel becomes a problem for careful consideration. There is no reason why such equipment should not be used until tools specially designed for carbide are available. But the problem must be looked at realistically. Without a flywheel, gear trains will take a beating and with it the mechanical brake will be abused.

The maintenance need not be abnormal if operations are restricted to suit the power and other characteristics of the equipment. It must be remembered that the highest-powered standard spindle in knee-type machines is around 20 hp., with the majority in the range of 10 to 15. Hence, the amount of stored energy is not in the brackets encountered in regular carbide milling.

Overload Relays

Equipment specifically designed for carbide should include in its specifications an overload relay in the table-feed motor line. All such equipment should have spindles and tables separately driven, and should have overload relays on the table-feed motor rather than on the spindle motor, although the latter is always seven to ten times larger than the former. A carbide cutter that has stalled because of overloading of the spindle driving motor is usually a damaged cutter. But if the table motor throws out and the spindle motor continues to run the cutter until free, no damage is done and a considerable expense is avoided.

A spindle adjustment should be specified that makes for simple and easy "heeling" or "toeing" of the cutter. To prevent a cutter from dragging across the cut, it is customary to toe it, that is to shift the position of the spindle from a true 90° relationship with the table travel to a slightly angular one. Such shifting of the spindle position should be easily and quickly accomplished, particularly for carbide operation.

When a workpiece is to be returned to its original position for purposes of unloading or any other good and sufficient reason, it is practically impossible to do so with carbide if the cutter heels. The drag of the teeth across the workpiece face will not only mar the finish but also usually damage the teeth. If this latter effect is not immediately noticeable, then undue tooth wear will result.

On some machines, tilting the spindle is next to impossible, whereas on others it is done clumsily by shimming out gibs alternately on top and bottom in vertical machines or front and back on the table in horizontal machines. Simple spindle adjustment is sufficiently important to justify insistent demands from production personnel.

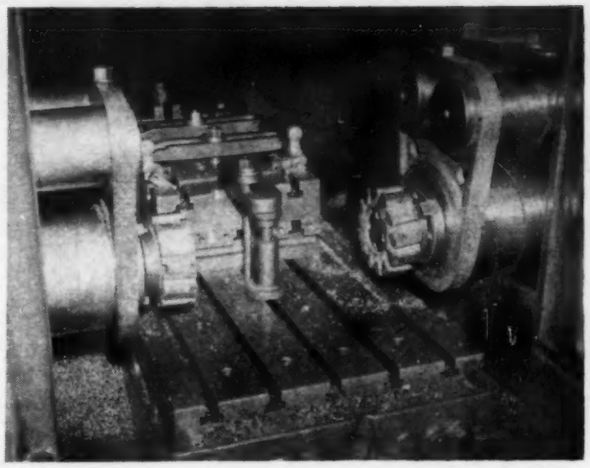
Climb Milling for Carbides

All carbide milling should be done climb, not conventional; that is, the work should be fed in the same direction as the tooth movement and not against it.

As climb milling is called for, the machine tool should have well designed and easily manipulated adjustments intended to take up wear between the table screw and the nut. The spit-nut arrangement, manually or mechanically adjusted, has proved satisfactory, and the double screw more so, at least on larger machines. But under no condition should a machine be purchased on which climb milling is done with misgivings, damage or both.

Machine-tool builders should be required also to provide sufficient protection to machine ways against the hot chips produced in carbide milling. Further they should be called on to give more thought to operator protection against these same chips, to bring the safety phase into clearer focus in designs intended for carbide tooling.

They should also be asked to give consideration to chip disposal, particularly when production operations are being scheduled on such tools. It is less difficult to build into a machine an adequate method of caring for the large volume of chips produced than it is for the user to do so.



Multi-spindle machines should be specified only after an analysis of cost, maintenance and cutter life is made. No two cutters, working simultaneously, wear equally

Finally, the machine designer should give thought to the problem of handling. The most frequently voiced and valid objection against the use of faster cutting methods is the negligible effect it has on the floor-to-floor time. Handling time is frequently considerably longer than the cutting time. Affecting the latter and subjecting the former to a laissez-faire attitude is only doing half the job.

Much can be done with handling, even the handling of one-piece jobs such as are encountered in the toolroom. There seems no reason why electrically, magnetically, pneumatically or hydraulically operated holding devices should not be designed into, and as an integral part of, the table or the machine.

A magnetic chuck is now available that makes possible the holding of heavy components against large cutting forces. A connecting rod, approximately 5 ft. between wrist pin and connecting rod centers, was recently held by means of this magnetic chuck while a 0.300-in. deep cut was taken with a face mill on the spindle of a large 30-hp. planer-type milling machine. Magnetic chucks are no longer only good for grinding and other light machining operations, but are now adequate for large heavy cuts with nothing other than end stops to assist them.

Why then cannot magnetic or other automatic chucks be built into tables of standard machines that will answer once and for all the persistent objection, "But it is impossible to reduce the over-all floor-to-floor time appreciably." ?

The machine-tool builder can help the job of removing metal in the modern way by concentrating on this need. And production personnel can do the best job of all by demanding that it be built into equipment designed to remove metal with 20% of the manhour expenditure required now all too generally with old and outmoded techniques.

Brazed Part Replaces Forging

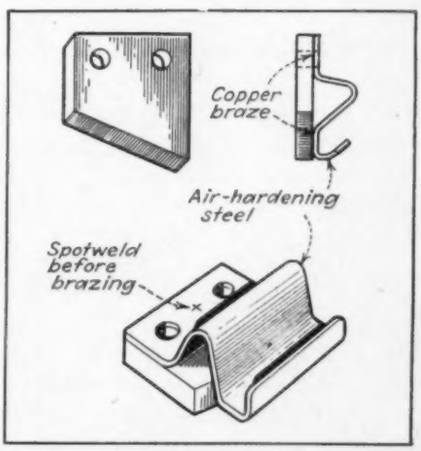
BY CHESTER S. RICKER

MATERIAL, machine time and heat-treating time can often be saved by substituting copper-brazed parts for machined forgings.

The Crosley door-latch keeper not only replaces a forging that had to be machined and heat-treated, but also utilizes excess furnace capacity, the space between cylinder-block pallets. Moreover, it is only one of several car and engine parts furnace-brazed at the same time as the cylinder blocks.

The latch portion is made from a strip of air-hardening steel, such as that used for valve tappet guides which come out of the hydrogen-atmosphere furnace at about 450 Brinell. The base is made from 0.125x1½-in. SAE 1010 cold-rolled strip steel, sheared and punched to size.

Assembly is made by inserting between the latch and base a 0.003-in. thick copper sheet having two mating holes. The holes in all three pieces are registered in correct relationship and the parts tacked together by a spot weld before brazing.



Crosley brazes door-latch keeper

ROUND TABLE

Work the Rules —or Rule the Works?

"What's up, Al, looks like you had a tough day."

"Oh, Ed, this was just one of those days when I feel like throwing it all over and buying a farm! All the propaganda they give you about rules so everybody will be treated fairly causes more unfair practices than anything else."

"Well, at least, Al, rules give everybody the same treatment. You know the minute you start giving in to one guy, you have to give in to everybody—then you get into trouble."

"I don't agree, Ed, I don't think any two cases are alike, and the minute you post a blanket rule you are as much as saying that all employees are alike. You are not recognizing that some violations are unintentional or when they are intentional, different circumstances call for different penalties. You've got to use good judgment."

"What is good judgment, Al? Foremen are all different in how strict they are in enforcing the rules. With ten men you have one foreman, but with a thousand men, you have 30 or 40. That many will be different in so many ways that fair treatment for all workers is impossible."

"That's my point, Ed. I don't think we should treat the men all alike. You take smoking, for instance: The rule is to give an employee a reprimand for smoking at other than regular times, but sometimes special permission should be given to an employee to have a smoke later because a rush job held him through the regular smoking period. He gets a reprimand, if you live up to the rule; if you use good judgment, you skip it."

"I think the fellow should get the bawling out; he shouldn't be allowed to smoke whenever the foreman says so—if enforcement is not uniform, somebody will start yelling favoritism."

"You can't make it so mechanical, Ed. These fellows aren't machines. You have to consider the individual. If top management can't trust the foreman to deal out justice, a new foreman is indicated."

"On the surface, you may be right. But I still think that the rules must be the same for all men and all foremen. It is true that uniform discipline is not always fair, but it is the lesser of two evils. It is more fair than having thirty foremen making up their own rules.

"I still think that about half of our problems are due to this mechanical handling of employees, Ed: If you violate a rule, a certain punishment is handed out—no matter what the circumstances. That's just like dictatorship."

"No it isn't. Every dictator has his favorites. It isn't as tough as you make it out, Al. Certain rules call for definite disciplinary action, but the foreman in most cases has quite a bit of freedom."

"Nuts, Ed—you mean just as long as one foreman handles it just like every other one. I don't see any freedom in that. I still think I'll buy that farm."

***HOW FAR** can the rules cover disciplinary problems? Should the foreman have complete discretion—or only in certain types of violation? Other readers will be interested in your ideas or opinions. Discussions of earlier topics will be found on later pages.*

Practical Ideas

Small Index Plate Attachment Doubles All Hole Combinations

FRITZ L. KELLER
Bloomfied, N. J.

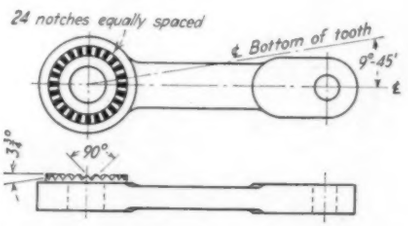
We had to make some cranks which had 24 radial serrations for accurate angular clutching around the drive shaft hole. The 24 divisions are easily obtained with three 120° holes on any index plate on the dividing head: 360 ÷ 24 = 15° between notches, and with the standard 40-1 dividing-head gear ratio (9° per crank revolution) 1 2/3 turns of the crank provides the necessary 15° spacing.

Difficulty arose in correctly locating the fixture and work for the first cut because the notches were set an awkward 9° 45′ away from the center line of the crank. Now, one revolution gives 9° indexing so the problem arises of how to get the 45 minutes. A 54-hole plate is handy, but the maximum breakdown is 10 minutes. One hole will be 9 × 60 ÷ 54 = 10′ indexing. One revolution plus four holes equals 9° 40′ and plus five holes would be 9° 50′.

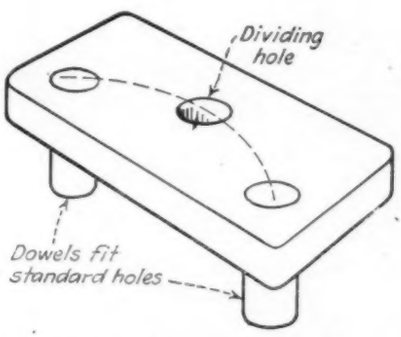
As this five-minute division is required only once, the simplest solution was a little gimmick which fitted into two holes and presented a central hole to halve the spacing during setup.

To make the little divider you have to determine the distance *a* and *a′*. Angle A is ½ the actual angle between any two holes in the 54-hole circle and this is 360÷ 54 = 6° 40′ so angle A is 3° 20′. Distance *a* can be determined quickly by direct measurement. (It's half the center distance of any two holes). Distance *a′* then equals *a* tan 3° 20′ or 0.0582 × *a*.

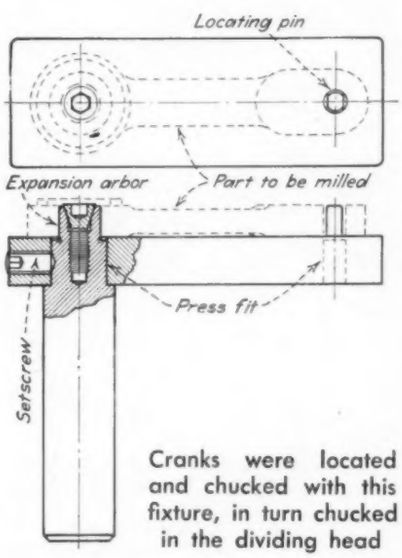
After the fixture has been trued and centered in the collet and the cutter set to cut radially, the index pin is placed in the new hole in the little divider, the whole plate is loosened and turned until a dial indicator mounted on the overarm somewhere shows that the axis of the part is parallel with the table feed. Now the plate is locked, the pin lifted, the gimmick removed, and the pin is moved one revolution plus 4½ holes, establishing the 9° 45′ for the first cut. Subsequent cuts are 1 2/3 revolutions, so set three arms at 120° or 18 hole intervals (all you need is a three-hole plate now.)



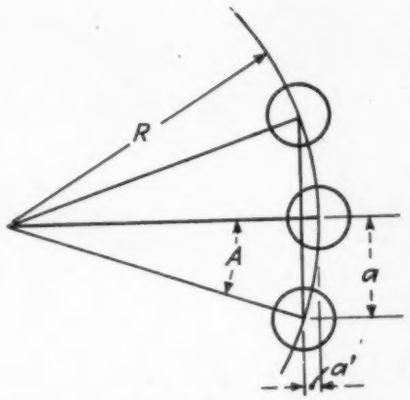
Clutch teeth had to be positioned 9°45′ away from central axis of crank, necessitating an unusual indexing arrangement for the first cut



A small divider straddles adjacent holes on the index plate and provides a hole midway between



Cranks were located and chucked with this fixture, in turn chucked in the dividing head



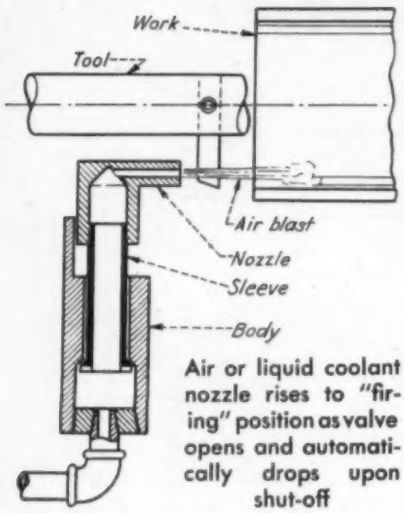
To lay out the divider, measure the inter-hole distance (2a) and calculate the offset, a′

Telescoping Valve Retracts When Pressure Is Off

A. F. SCOBLIC
Milwaukee, Wisconsin

A two-fold problem was solved with the application of a disappearing valve which I recently conceived. Its success was outstanding and its practicability for other applications was assured. Our application was the boring of long cylinders, in a horizontal boring setup. Our problem was to shoot a fast stream of coolant through the cylinder to wash out the chips, as well as to get the nozzle out of the way to clear the tool when traversing the table for the loading or unloading position.

The valve consists of a steel bar



Air or liquid coolant nozzle rises to "firing" position as valve opens and automatically drops upon shut-off

having a reamed hole for a sliding fit with the sleeve. The lower end of the hole is tapped for a pipe plug, which is in turn, tapped for a pipe fitting the size of the coolant pump. The top end of the sleeve is threaded to screw into the nozzle. The nozzle is made of aluminum for lightness and has a large hole drilled and tapped to receive the sleeve. The forward end of the nozzle has two holes of smaller size, with a total area about half that of the supply pipe. The nozzle is a rectangular-shaped piece and is kept from turning, by the back of the valve body.

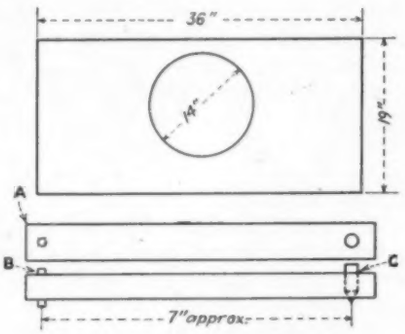
When the table is moved into position, the tool in the boring bar passes over the nozzle, which is in the down position. As soon as the boring bar is set in rotation for the start of the cut, the coolant is turned on. A pressure is created at the top of the nozzle, due to the reduction of area in the small holes. This pressure raises the nozzle and brings the stream directly into the bore of the cylinder and at the same time increases the force of the coolant for washing out the chips. At the completion of the cut, the coolant is turned off and the nozzle automatically drops out of the way. Because the nozzle position is controlled by the coolant supply valve, the danger of manually placing a coolant hose near a tool is eliminated.

Eccentric-Scriber Tram

DONALD A. BAKER
Boonton, N. J.

Making a sheet metal dust cover for a woodworking machine involved the cutting of an accurate 14-in. hole to fit a rotating head closely.

Lacking dividers, we made a wooden tram having a ⅛-in. pin at one end and an eccentrically-ground center punch at the other end. A ⅛-in. hole was drilled for the hole center and the tram tried and adjusted by turning the punch until the radius was correct. This device was intended only for scribing, but by applying plenty of pressure and alternating from one side of the sheet to the other, a clean hole was produced in a short time.



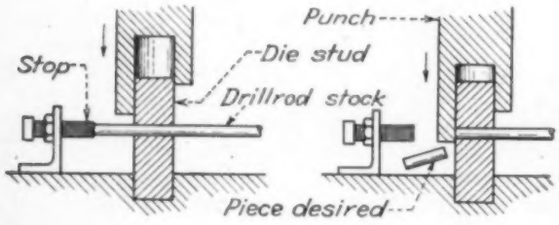
Eccentric point C adjusts radius

High-Speed Pin Cutter

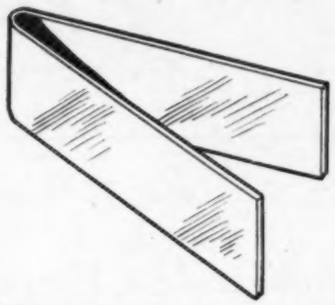
FRANCIS J. NOON
Philadelphia, Penna.

For use on a ½-ton punch press this small die set will cut short pins at a rapid rate.

The punch and die, or rather the two shear blades, slide one on the other at all times, maintaining close alignment. The part called the punch is just a piece of rod bored a short distance so the die stud can slip in and out, and it is cut away on one side. The punch is hardened and the projecting side is ground into a cutting edge. The die stud is hardened and ground after drilling to the stock diameter.



Positive alignment and solid work support assures clean, smooth pin shearing

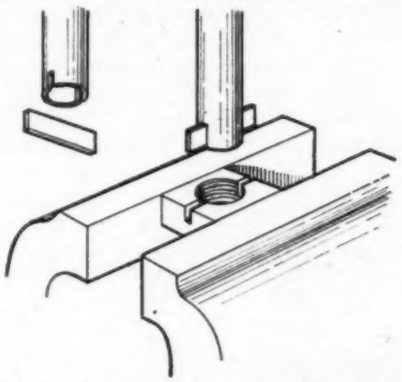


Drillpress Parallels—One 17-in piece of ⅛ x 3-in. cold rolled bent over a ¾-in. rod to a 20° angle makes a handy work support. It will not walk or tip over and it's high enough to take care of punch holders, etc., while the angle will accommodate narrow flanges of many diameters. *H. Lawrenz, Brooklyn, N. Y.*

A Tip On Tube Tapping

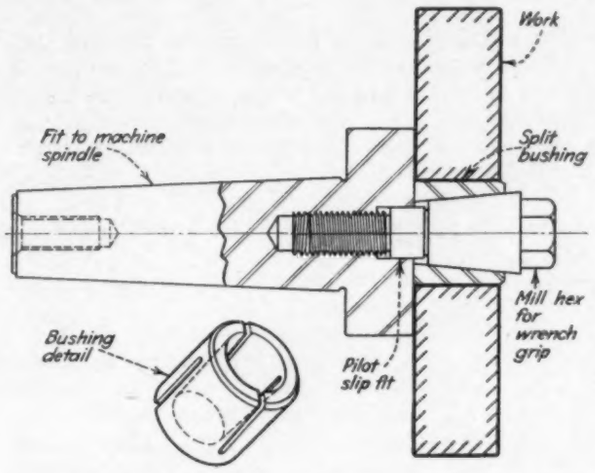
N. YONTEFF
Bronx, New York

If you've ever tried to tap a hole in round bar stock or tubing, you know what an exasperating struggle it can be. Despite V-grooves or any



other device and no matter how tightly it is gripped, it will turn in the vise jaws.

After all else had failed, I developed this device and found it highly effective, and unlike other methods, the grip on the round stock or tube does not involve pressure. Allow ample extra length (at least ⅝ in.) for grip, which can be cut off after the tapping is finished. Choose a nut (square or hex) with a thread whose root diameter is equal to or slightly greater than the outside diameter of the round stock or tube. With a hack saw, cut a deep groove across the end of the round stock or tube and across the nut. A small flat piece of metal slightly less than 1/16 in. thick is fitted snugly into the tube's groove. The round stock or tube may then be securely keyed into the nut which is held in the vise.



Three-element expanding mandrel has separate bushings facilitating replacements and size changes

Split-Bushing Expanding Mandrel Has Flexibility of Application

ROGER ISETTS
Kenosha, Wisconsin

Jobs often come along which call for turning the diameter of a piece in relation to a previously-machined center hole. In most cases, the rough blank or forging has been broached to a specific size and all subsequent operations located from this hole.

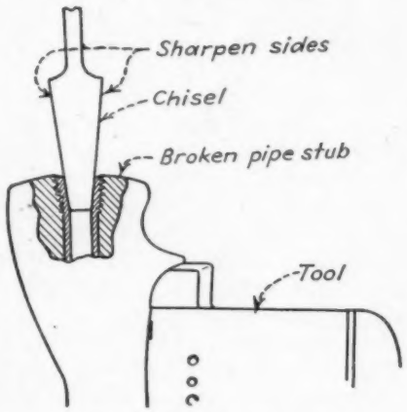
In a great many cases the blank is plain; that is, it has no surface upon which a clamp or other arrangement can be placed for driving purposes. Obviously, it would be impossible to drive from the diameter, so the only alternative is an expanding mandrel which will exert enough pressure in the center hole to resist the thrust of the cutters while the work is turning. This mandrel is easy to make and has proved itself effective and fast-operating.

The body of the mandrel is made from round cold-rolled stock. On one end a taper is formed to fit the spindle of the machine. On the opposite end a hole is counterbored and tapped to receive the stud.

The split bushing is made from a piece of hardened tool steel, ground to slip-fit the work. Four slots are milled, two from the top and two from the bottom, alternating, but not cut through. A taper is ground on the inside to fit the stud. The bushing acts in much the same way as an ordinary collet.

The stud is also made from hardened tool steel. On one end a thread is cut to fit the body, and just ahead of it, a pilot is ground to fit the counterbore to align the stud with the bushing and a taper is ground to fit into the bushing. An included angle of 10° has proved satisfactory for most work. On one end a hex is milled to a standard wrench size.

After the work has been loaded, a few turns of the stud and the work is clamped rigidly in place. Since there are three separate parts to the device, any one of them can be replaced individually after they are worn thus making it unnecessary to scrap the entire tool. If different-diameter pieces are to be turned suitable O.D.-bushings can be provided.



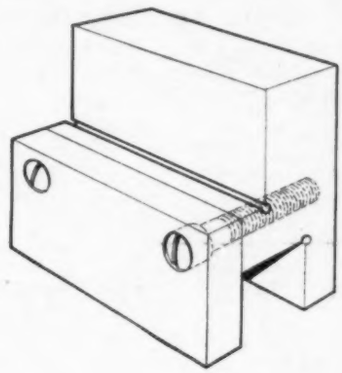
Drive chisel in, then turn

Chisel Withdraws Pipe Nipples

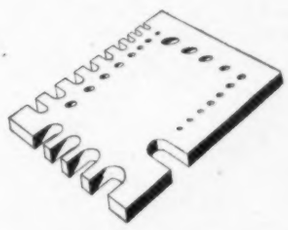
GEORGE F. BURNLEY
Oakland, Calif.

Several weeks ago, I had occasion to remove several broken-off air pipe stubs which had become lodged in the handles of pneumatic shop tools. Many of these stubs were flush with the handle casting leaving no projection which would accommodate a wrench or pliers. Then, too, the threaded portion which remained inside was so thin that an "Easy-Out" or similar patented left-hand burr would crush the thin shell ruining the threads of the tool and leaving jagged pieces of pipe inside which would have to be removed in any event.

To overcome the difficulty, I found a cast-off cape chisel whose blade tapered from zero to perhaps three inches. I ground both edges to a vee, then, securing the handle of the pneumatic tool firmly in a vise, with a single sharp blow I drove the cape chisel down into the broken pipe. As the sharp sides of the chisel had powerfully engaged the broken pipe, I took a crescent wrench and carefully twisted the stub out of the hole.



Edge Finder—Requiring no slot grinding, this two-piece gage is easy to make and becomes a valuable tool in jig boring work. The body of the gage can be surface ground at a single chucking (starting with one ground side), by measuring directly up to the three steps required. The cover is simply screwed on and the ends and sides trued. *Richard Pfister, Newark, N. J.*



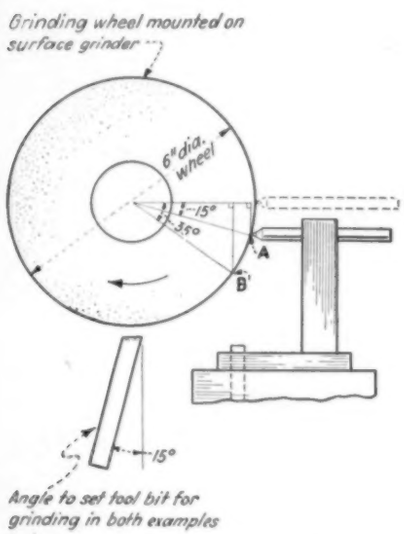
Bench Plate — Laying out round-ended keys and boring bar wearing strips, punching bearing cap packing and other similar jobs has been speeded up with the aid of this plate made out of a scrap die annealed and machined as shown. *J. A. Raught, Racine, Wisconsin.*

Dressing Wheels For Concave Grinding With Proper Angles

ARTHUR F. HIRD
Lakeview, Ontario, Canada

Concave or convex radii are usually put on wheels with a diamond set level with the wheel center. The trouble with this is that toolbits all require a clearance angle, so with the tool set at an angle to the wheel radius, the cutting edge will be the arc of an ellipse, not circular as desired.

Dressing the wheel to an ellipse in the first place will offset this deviation and cause the bit to be ground correctly. Suppose a bit is to be ground with zero rake and 15° front clearance, for instance. The



True-radius grinding requires that the wheel be elliptically-dressed to offset the toolbit clearance and rake angles. Point A represents diamond position for 15° clearance, zero rake; point B for 15° clearance, 20° rake

wheel will be moved up or the diamond down, as the case may be, the sine of 15° times the mean radius of the wheel from the level position (shown dotted). This may be expressed: vertical displacement equals mean radius sine 15. If the wheel is 6 in. in diameter and the radius is to be ½ in., the mean radius would be 3 minus ¼ equals 2¾ and the vertical displacement is $2.75 \times 0.259 = 0.712$ in.

Suppose the bit is to have the same radius, and clearance angle but a 20° rake as well. This acts to offset the arc into an even flatter ellipse, so the two angles are simply added together making 35°, the calculation worked out in the same way, the wheel dressed and the bit ground, setting it at the same (15°) clearance angle. Any combination of rake and clearance totalling 35° can be ground on this same dressed wheel for a true circular ½-in. radius, with the bit set at the proper angle to give the desired clearance each time.

Puller Removes Ball Bearings Without Damage

A. F. SCOBLIC
Milwaukee, Wisconsin

Our service department has been confronted for some time with the problem of removing anti-friction bearings. A great deal of trouble was encountered and damage done to housings in the process of removing the bearings by tapping, prying or other "cut and try" methods.

I designed a bearing puller which has proved to be extremely practical. Bearings are now removed with ease in about one minute.

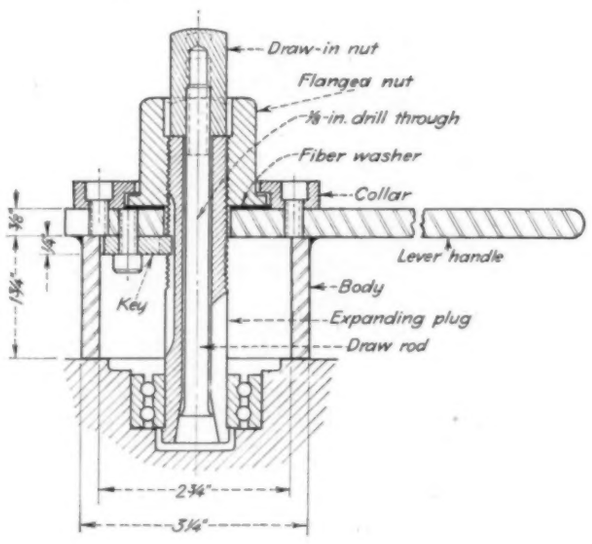
The body of the tool consists of a handle and piece of tubing. The expanding plug has three slots and a shoulder at the lower end, and the top is threaded for a flanged nut. A hole is drilled through the plug and the lower end taper-bored. The plug also has a keyway and key to prevent it from turning. The drawrod has a taper on the lower end and is threaded on the opposite end for the acorn "pull-up" nut. A free-fitting collar is fastened to the handle to act as a bearing for the flanged nut. Below the flanged nut is a fiber washer to prevent cutting the contact surfaces when under pressure.

To apply the tool, the flanged nut is unscrewed sufficiently to allow the expanding plug to extend through the bearing to be withdrawn. At this point the acorn nut is loose to permit the expanding plug to be squeezed through the bore of the bearing. The tool is then placed on the housing with the plug extending down through the bearing bore. The next step is to draw up the acorn nut, which expands the plug and places the shoulder beneath the bearing. Then turn the flanged nut with a wrench, while holding the handle to prevent the tool from turning. This action raises the expanding plug and with it, the bearing. The acorn nut is then loosened and the bearing slipped off the expanding plug, completing the operation.

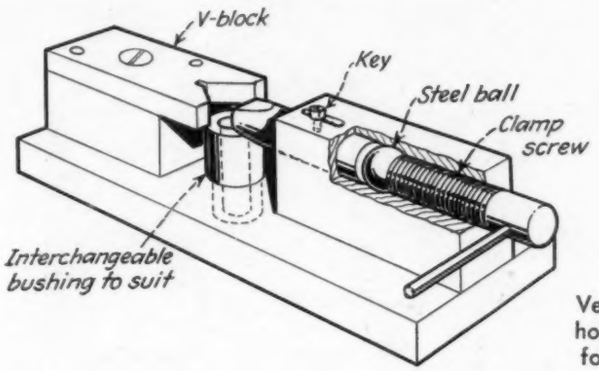
The purpose of the acorn nut (instead of a common nut) is to prevent marring the threads while placing the wrenches.

When this type of tool is to be used extensively, it is well to harden certain parts to insure long life.

Although the expanding plug is suitable for only one bore, others can adapt the tool to a wider range.



Tight-fitting bearings in motor end bells and various mechanism frames are drawn out smoothly by expanding a flanged, split tube within the bearing bore and screwing with a wrench



Vertical V-block clamp holds pins and bushings for tapping or chasing

V-Block and Clamp Unit Speeds Tapping Jobs

DONALD A. BAKER
Boonton, N. J.

Consisting of a V-block and an opposed sliding-pin clamp, both horizontally adjustable on a permanent base, this fixture can be set quickly to "chuck" work of any diameter.

Vertical bushing units of any size can be installed to locate the work, whereupon the V-block is adjusted to bear against one side without binding. The screw can then be positioned quickly and a fraction of a turn will lock or unlock the part.

The fixture was originally designed for handling steel inserts for plastic parts and thousands of these were made. For these parts, a stud on which the work rested was substituted for the bushing. The next parts we handled required changing the stud by putting a hole through it to clear the tap and allow the chips to fall through. Rods have been threaded by substituting a die-head instead of the tap in the drill-press tapping attachment. With slight changes in V-blocks and rest studs a surprising variety of work can be done with this simple fixture.

Parting Tool Prop—Large diameters can be cut off using standard parting stock without difficulty when a tongue and grooved prop is placed under the outer end of the tool. A piece of an old file ground slightly narrower than the tool will serve. *Daniel O'Leary, Calgary, Alberta, Canada.*

Tailstock Setup Chases Small Screws

L. A. H. CASPER
Ladysmith, B. C., Canada

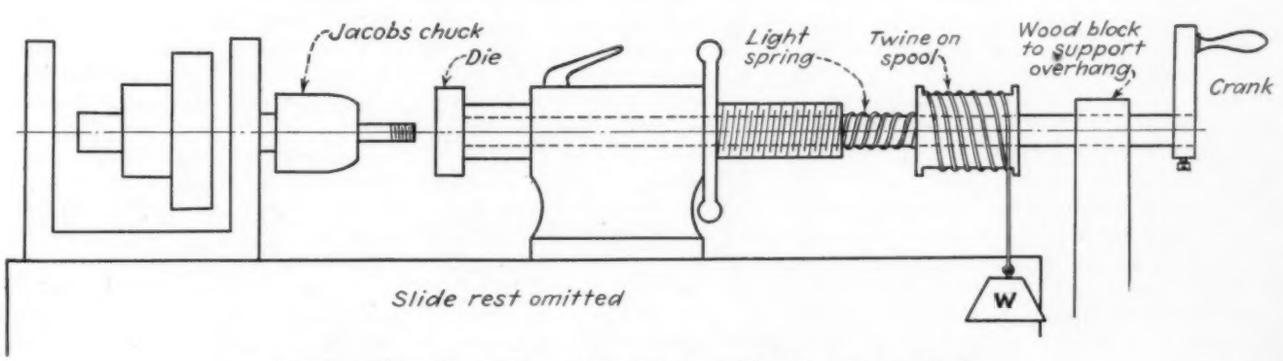
We once had occasion to make several hundred dowel screws. Material used was ¼-in. brass screw rod, length of screws ¾ in., threaded about halfway. At first the screws were made in the simplest way using a small English-type bench lathe, equipped with a Jacobs chuck on the spindle nose. Threading was done by pulling the belt around by hand, but this was too slow.

The lathe was equipped with a tailstock spindle bored right through with ⅜ in. clearance. A small die holder for 13/16 in. button dies was made up and fitted to a length of ⅜-in. steel bar which was passed through the tailstock spindle. On the far end of this a crank was attached. Now, instead of pulling the belt by hand, the headstock spindle was locked and the die was cranked on and off the stock. This was a great improvement over pulling the belt.

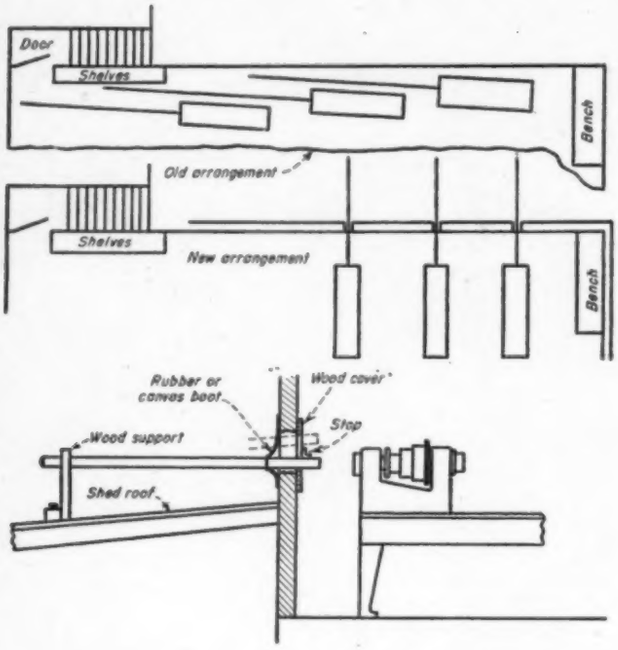
But it was thought that better time might yet be made, and a further gadget was added. In order to save the time taken by unwinding the die—Landis and Geometric heads being out of the question—a small spool was mounted on the ⅜-in. shaft, and a bit of good twine wrapped round. On the free end of the twine a suitable weight was hung. Now, after threading, a start in reverse was enough and the weight removed the die quickly. As the weight was falling and the unwinding going on, the lathe was started and the screw parted off. As many as 178 screws an hour were produced in this way.

It was found desirable to set a light spring between the back end of the tailstock spindle and the spool to preclude any possibility of the die catching the screw when starting the lathe to part off.

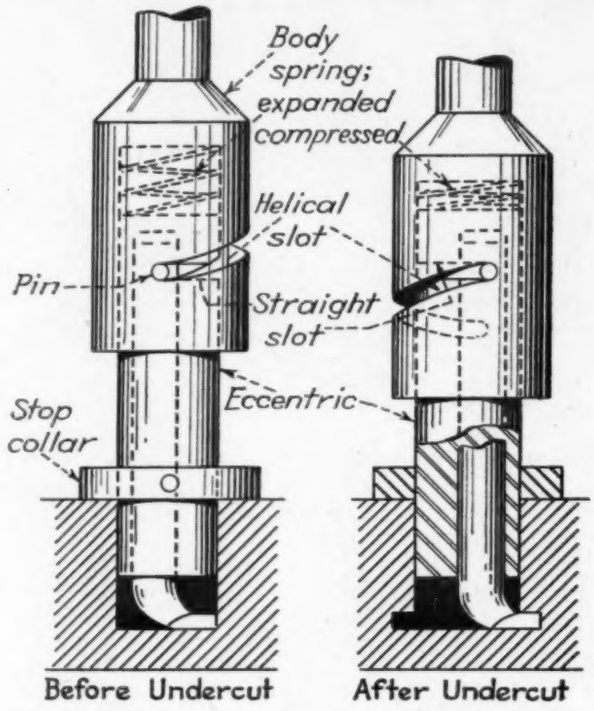
In lieu of a stop to insure correct setting for length of the blank, a rough finger stall was worn on the right hand and interposed between the end of the stock and the die, backed against the tailstock.



Hand crank, spring and counterweight speed hand screw production



Neater arrangement and more floor space resulted when stock pipes were "evicted"



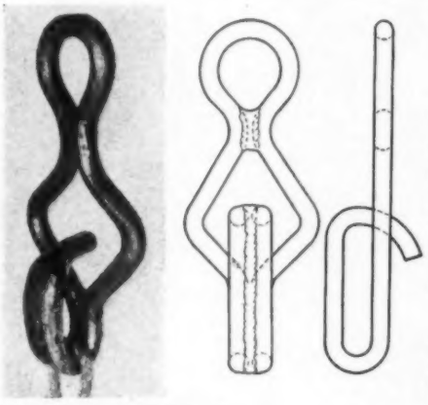
Eccentric sleeve arrangement permits boring and undercutting in a single motion of the drillpress

Poke Your Feed Tubes Out Through the Wall

BEN ARNOLD
Boonton, N. J.

For a long time we were cramped for space with our screw machines set up in the conventional arrangement staggered nearly parallel with the wall. What made this particular setup especially bad was the fact that the doorway and some shelves which held screw machine tools and miscellaneous parts were obstructed by two of the bar stock supports.

Our solution seemed a little drastic, but it works, and with no ill effects. We turned the lathes so the headstocks faced the long wall and spaced them at a convenient working interval. Then we cut vertical slots through the wall of the building just wide enough to take the stock tubes and high enough to allow some lift. We were lucky to have a shed against this wall so we had only to attach short U supports to the shed roof. The outer end of the tube is closed off and stock is loaded by lifting the inner end until stock can be fed in clear of the headstock. The job was finished with a wooden inner wall plate enclosing the tube neatly, and a short brazed-on angle to keep the tube from falling out. A flexible rubber boot sealed the hole against the weather.



Simple Safety Hook

DAVID B. CLAPP
West Orange, N. J.

Light to medium loads which must be hooked and unhooked frequently, but absolutely must not come unhooked accidentally, can make good use of this one-piece safety hook.

Easy to make, it requires only a piece of ¼-in. rod about 2 ft. long, which is bent and welded as shown. When hooked onto a rope eye-splice or knotted eye or on the bight of a line, it is practically impossible for the line to come unhooked. The tang is too long, of course, to admit some solid metallic eyes or thimbles, but the design could be modified to suit by shortening the point a little.

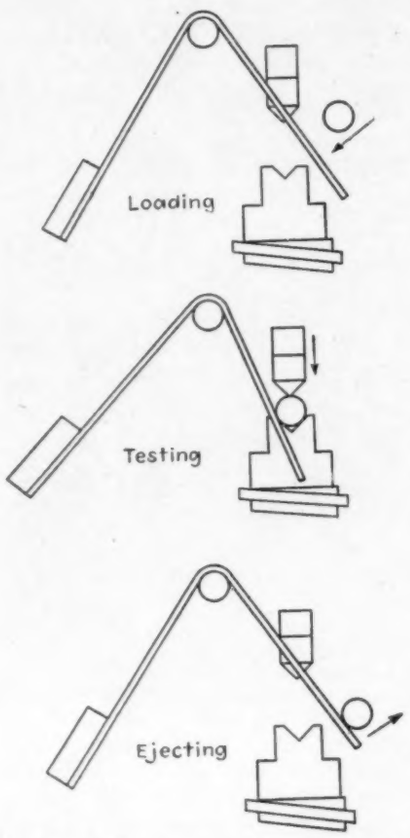
Drillpress Undercutting Tool

H. MOORE
Leeds, England

With the aid of an eccentric tool-holding sleeve, an adjustable stop collar, and straight and helical slots, this tool is capable of spot-facing or counterboring, boring, and undercutting the hole bottom in a single operation.

To spot-face, the boring tool is rotated by hand relative to the drillpress spindle. This turns the pin in the straight-slotted eccentric and in the helical-slotted tool body. The helical motion lifts the tool and eccentric against the coil spring and causes the eccentric to feed the tool outward. This can't be held by hand, though, for the tool automatically returns to its small cutting diameter when released because of the spring. It is therefore necessary to use a temporary block to reach the stop collar when the bit is at the correct depth.

A typical operation might be a spot face, bore, one or more intermediate undercuts, and a bottoming undercut. This could be accomplished by setting the tool as follows: Adjust the stop collar for the maximum hole depth and position of the final undercut. Then prepare suitable intermediate blocks.

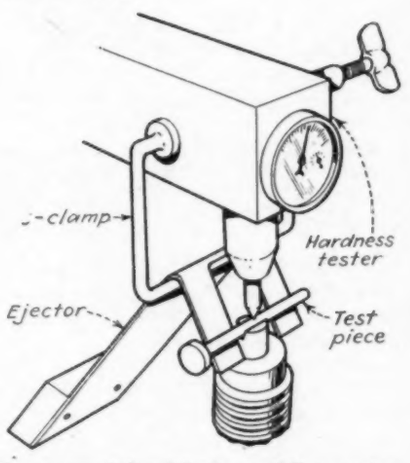


Faster testing is possible using this automatic unloader

Automatic Ejector Improves Rockwell Hardness Tester

MARTIN RHOADS
Baltimore, Md.

This simple device made from an old C-clamp, a piece of sheet metal, and a balance weight, will increase the efficiency of the Rockwell operator 30%.



Counterweighted fork straddles testing anvil to eject part automatically when test is completed

Once the parts are placed on the anvil the operator has no further need to handle them.

When the operator places the part, he automatically moves the device into position by pushing against the fork which is cut out of the sheet metal. After the part is positioned, the fork bears against the part during the Rockwell operation. Immediately after the screw is retracted, the fork, aided by the weight, lifts the part from the anvil and deposits it into the bin.

Height Gage Sets Planer and Shaper Tools

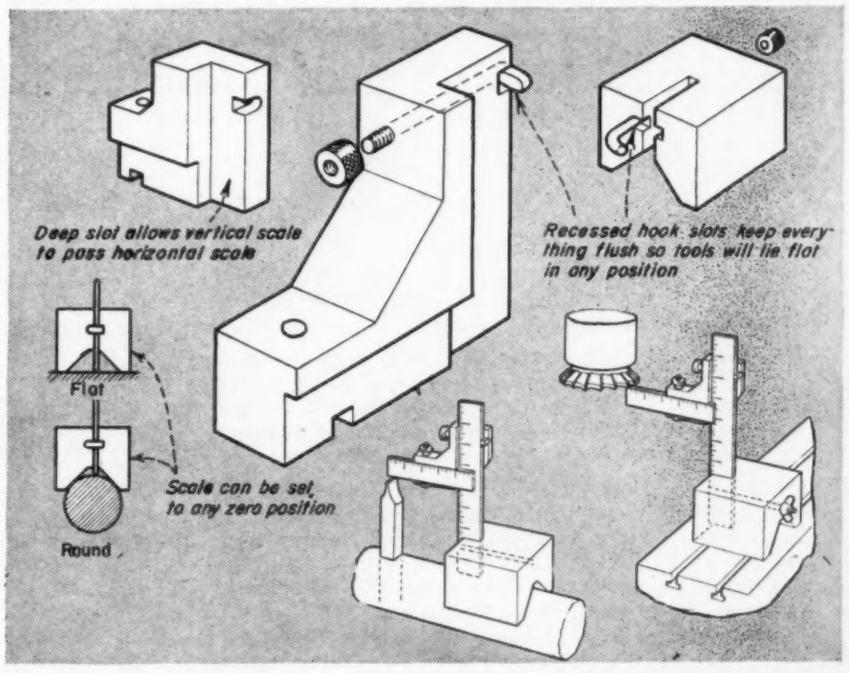
A. F. SCOBLIC
Milwaukee, Wisconsin

In my experience I have found that many machinists are using the customary surface gage for setting milling machine cutters, planer and shaper tools and others. The surface gage is set by a scale and then placed at the point of the tool or cutter. By this method, errors are often made by either jarring the pointer and changing the setting (without realizing it) or by pressing too hard on the pointer. Often, the setting of the pointer is changed by merely placing the surface gage on a bench or machine abruptly.

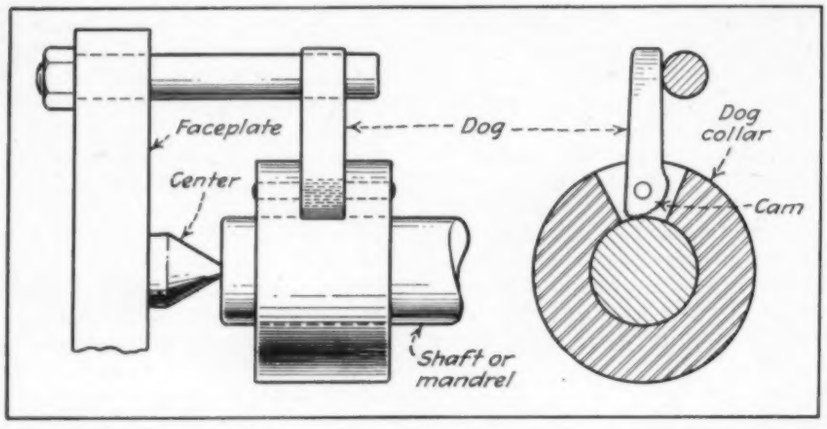
To eliminate all these difficulties, as well as increase production, I made a simple V-block. The block is provided with a clamping screw to grip a standard 12-in. scale inserted in the slot. A standard right-angle attachment and an additional scale, furnish the remaining tools. The various parts are assembled as indicated by the sketch.

When used as a gage for setting milling cutters or planer tools, the vertical scale gives a direct reading of the height. It is a simple matter to set the tool for rough and finishing cuts, with accurate results. It is also time saving in setting gang tools on a planer. Its use provides the operator with a quick method of setting tools and at the same time enables him to see the setting at all times.

The tool works equally well for setting boring tools to scale sizes. It is only necessary to determine the distance from the surface of the bar to the point of the tool. The reading on the vertical scale provides this. The horizontal scale is set at the point of the tool. The tool is especially handy in setting tools in boring heads where there are two or more tools which must be set at different diameters for roughing out heavy stock.


Deep slot allows vertical scale to pass horizontal scale
Recessed hook slots keep everything flush so tools will lie flat in any position
Flat
Scale can be set to any zero position
Round

V-block scale-clamping base, two machinist's scales, and a standard 90° attachment assemble to form a convenient and dependable height gage which can also make direct horizontal measurements for setting tools



Cam-type lathe dog requires no flats, keys or screws; works automatically

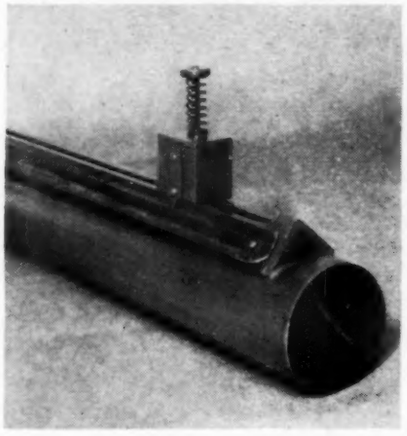
Automatic Lathe Dog Has Quick-Acting Lock

JOSEPH MATE
Chicago, Illinois

Here's a lathe dog which will drive any shaft without resorting to set-screws, wrenches, special flats, keyways or complicated chucks. The only drawback is that any one dog is good for only one diameter of work within about 1/32nd of an inch. The dog consists of a loose-fitting sleeve or collar which is slotted transversely deep enough to receive a lever and cam pinned to the ends of the sleeve. As soon as the faceplate strikes the lever, it causes the cam to dig into the shaft and the locking action increases with driving torque. When the spindle stops the lever will usually fall open, releasing the cam but a return spring or just a touch of finger could release it if it tended to stick.

I have made these dogs in several sizes and they all work well, and as the device is primarily intended as a time-saver for production jobs, the one-size-only drawback disappears.

Shaft Scriber—A piece of angle is milled along the vertex making a wide flat at 45° and creating a ⅛-in. slot almost the full length of the piece. A discarded flexible steel tape is riveted to one side and a block fitted to the milled flat with two screws or pins to act as guides. The



block carries a vertical scriber-punch and a corresponding pointer to read against the scale.

Straight lines can be scribed on round stock by depressing the pin against its spring and drawing the block along, and a series of holes can be prick-punched by referring to the scale graduations. *M. W. De-Punz, Aurora, Illinois.*

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(in addition to regular payment for all exclusive contributions published)

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Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

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How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Twenty-ninth Selection—E. J. Hills' Contour Milling Device

NEWS OF METALWORKING

Some Finished Steel Supply Lines Easing; Sheet Market Remains Tight

PITTSBURGH—A return to normalcy in several finished steel products, which means a balance between demand and supply, is not far distant, but this does not include such items as sheets, merchant pipe, plates and small shapes. In other materials, there is tendency for pipe lines to be filled and this means that a greater proportion of the tonnage production can go directly to meet end use requirements.

The outlook in this respect, therefore, is for demand to be gaged by current consumption.

In those items where production is lagging far behind demand it seems likely that the second half of the year will have been well underway before pipe lines in respect to such products will have been filled.

Pressure Tends to Ease

Raw steel production has been of such steady continuation at close to capacity rates that week by week some of the pressure in respect to finished steel tends to ease. Notwithstanding all the efforts made to channel semi-finished to mills producing light flat-rolled, the sheet market has been of critical importance to the automobile industry. Strangely enough, the recent rate of sheet output has favored cold-rolled sheets and this volume is substantially above the prewar rate, while that of hot-rolled sheets is under it, and yet the greatest dearth of sheets in automobile centers has been cold-rolled.

Recently, it was indicated some additional steel that comes off cold-reduction mills has been channeled to tin plate and output of this material so far in 1947 has been substantially higher than in 1946. At the same time, the production of cold-rolled sheets also is higher. In point of tonnages, the gains have been pretty much the same which means a larger percentage in the case of tin plate.

Fabricators See Better Supply

Fabricators of assorted steel materials are reporting that their steel deliveries, except in the case of sheets, have tended to be better during the month of May than was the case in April. This means that items such as large shapes and channels, large-sized bars, various alloy steels, nails, etc. have eased. Small shapes and plates remain tight because of the influence of the railroad equipment program on supply, and this condition may be expected to continue for several months. Plates are also in sizable demand because of needs in the oil industry—for large diameter pipe and for tanks.

Readjustment Period Cited

Many in the steel industry are now gradually coming around to the belief that the late 1947 outlook in respect to business will be influenced by the time it takes American industry to readjust itself to the so-called recession which many now believe imminent as a result of the organized effort to reduce the price level generally.

Long-Range Outlook Good

Steel executives still feel that the unfilled demands for goods are so great and there are funds to satisfy them that the long-range outlook for business is good if the nation can conclude its readjustment in short order. If readjustment is a long-drawn-out affair, they are not so sanguine of the outlook.

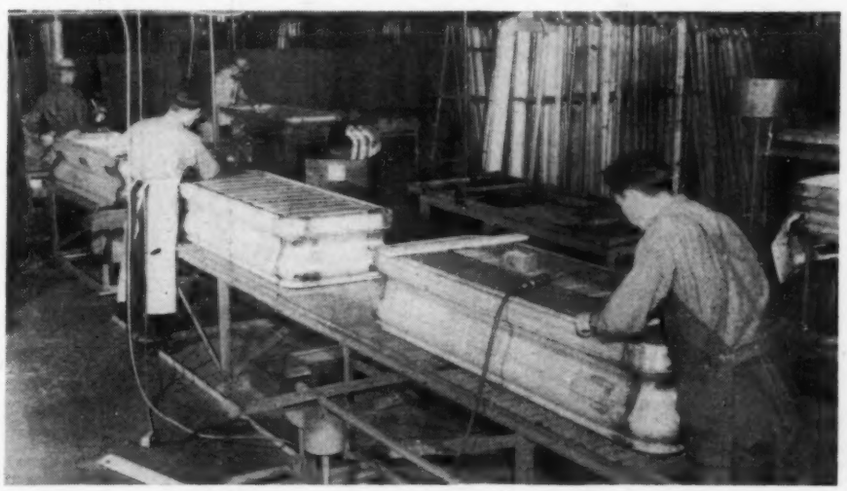
Coal Situation Important

The immediate feeling in respect to the coal mine crisis which will develop June 30—unless there is a labor agreement with the United Mine Workers—is one of confidence. Most executives believe there will be a satisfactory deal in respect to Northern coal mining, at least, before the critical date. Such success would mean an uninterrupted era of steel production throughout the balance of the year.

New Steel Contracts Contain No-strike Clause

WASHINGTON — Unlike agreements in other years, the new U. S. Steel, Allegheny Ludlum Steel and other contracts with the CIO's United Steelworkers do not permit strikes if the contracts are reopened next spring on wages.

If new wage demands are not settled after a month of negotiation, the contracts continue in effect for the remainder of the two-year period, including the no-strike clause.



Assembly Line Caskets—An example of postwar diversification is seen at Ryan Aeronautical Co., where welded, high-quality chrome-nickel alloy caskets are being produced on an assembly line basis at the rate of 500 a month. All parts of the 300 lb. "Grecian Urn" are interchangeable. Other features include a tensile strength of 82,000 lbs. psi and airtight sealing with five toggle type latches. Welded seams are shown being ground smooth at the San Diego plant

Russia Strives for Prewar Output At Heavy Machine Building Plant

Bemedaled Foreman—A shift foreman at the Novo-Kramatorsk Works, P. Romanenko, wears decorations for achievement on the production front

MOSCOW—Restoration of one of the world's largest enterprises of heavy machine building, the Stalin Works at Novo-Kramatorsk in the Donets Basin, is proceeding with such speed that its prewar capacity is expected to be reached by the end of 1948.

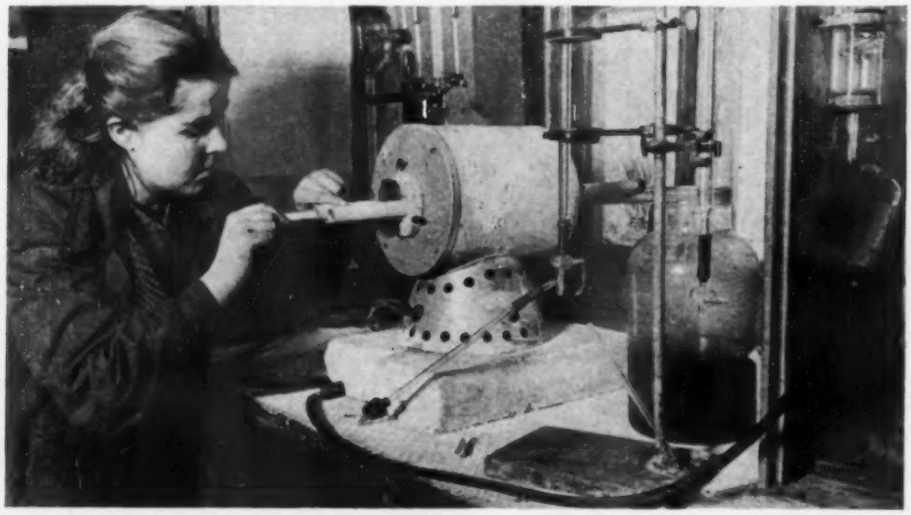
Although the greater part of its equipment had been evacuated when the enemy approached the Donbas, damage has been so great it is estimated at 550 million rubles. Within less than a year, 14 shops were rehabilitated and output of equipment for the iron and steel and mining industries was restarted.

Among major orders filled by the Novo-Kramatorsk Works since reconstruction work began are the principal parts for the first postwar blooming mill for the Transcaucasus Iron and Steel Works, and shafts and other parts for the new hydro-turbines giving life to the giant power station on the Dnieper river.

An ingot with a record weight of 230 tons has been cast here for the 102,000 hp. turbine to be installed at the Dnieper Hydro-Electric Station.

The Novo-Kramatorsk Works are again dominating the heavy machine building industry in the Soviet Union. With every month that passes, more and more of its floor space of 440,000 square meters, scattered over a territory of 520 acres, is beginning to take part in the production process.

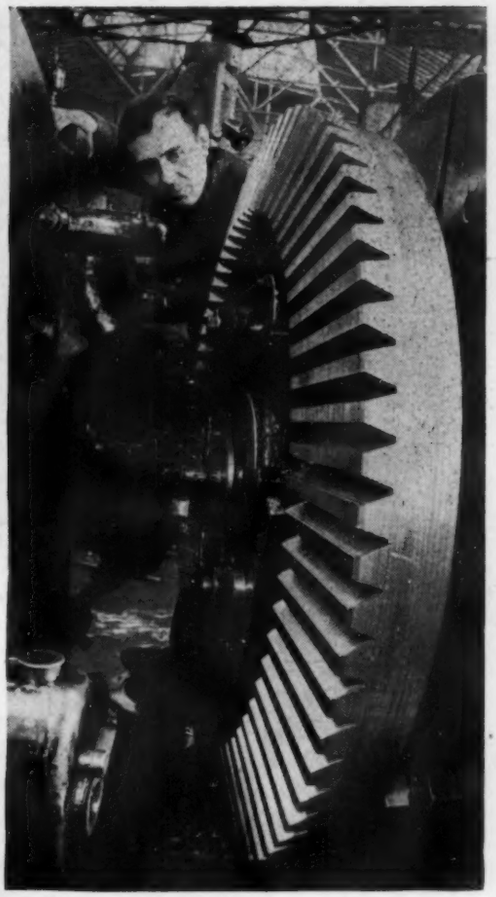
As several of the illustrations indicate, young boys and girls are being trained for future roles in Russian industry. Youths entering many of the trade schools don military uniforms and are subject to rigid discipline in learning their crafts. The Russians are interested in having ready replacements in their production scheme for retirements and death.



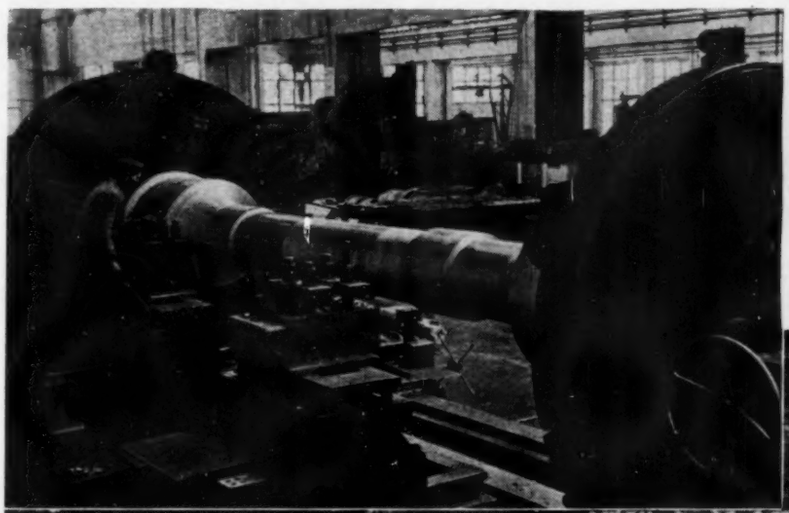
Steelmaker Expert—Ivan Shapovalov is one of the best at the N-K Works. He typifies the sturdiness of Russians

Training Youth—Russia's youth become production-minded early. Boys in military uniform are shown in a trade school. Other young workers are shown in class and at work

Massive Gear Shift is ready for shipment from the N-K Works to a steel mill. Heavy equipment, such as this, is being turned out in Russia under a stepped-up program. Head of the gear dept. checks shaft



Cone-shaped Gear Wheel is being machined in a machine shop at the Novo-Kramatorsk Works. Vasili Zanin is performing the job



Machining and Inspection—In the upper photo, a part for a blooming mill is being turned on a large lathe. In the other photo, an assembly foreman examines through a microscope the machined surface of a huge planer

Gaging Business

Shipments Reflect Levelling Off

Preliminary figures on machine-tool shipments for April are not very heartening. They reflect a general levelling off in orders, but most builders anticipated this and believe the outlook for the rest of the year is good.

Total industry-wide shipments for April are estimated at $26,766,000, a drop from the March figure of $29,012,000, according to the National Machine Tool Builders' Association. Based on reports from 90% of the industry, new orders for April amounted to $18,167,000, compared to $19,509,000 for March. Heavy domestic cancellations were registered in April with the preliminary estimate at $1,813,000, nearly $400,000 under March.

Foreign machine-tool shipments for April are estimated at $6,330,000, a 17% drop from March. Preliminary figures cited new foreign orders for April at $4,899,000, a 7% decrease compared with March.

Scrap Market Quiet

The scrap market has been a quiet affair in recent weeks and no material changes are expected. Some steel executives expect the tightness in scrap to continue for some time, and are committed to a period of increased use of hot metal to alleviate scrap requirements.

Steel ingot production levels in the Pittsburgh district have been at the year's best recently, a recent week having shown a 104% rate, to equal the year's previous high made in mid-March.

Surplus Threat Dims

Surplus machine tools are not causing quite the concern to manufacturers that they were a few months back. Some buyers of surplus machines have ordered new machines to round out their production lines. Complaints are still being heard that the second-hand machines cost too much to put into good operating shape. This has made several prospective purchasers chary, and they are now convinced new equipment with up-to-the-minute tooling is their best bet.

Distributors are encouraged by the number of inquiries they are receiving. Those who are buying know exactly what they want, and increased productivity is a key issue. Delivery promises are improving. Meanwhile there is still a tendency to hold off on placing orders for new equipment, even though paper work is completed. When the orders eventually come through, they will be substantial.

Textile Machinery Replacement

Convinced that increased productivity must come from the replacement of existing equipment, textile manufacturers have boosted orders for new machinery. Higher prices are of little or no consequence. The 1944 estimate of $640 million for new textile machinery has been boosted to the billion mark. The industry is interested in streamlined machines for increasing productivity.

Challenge to Plastics Industry

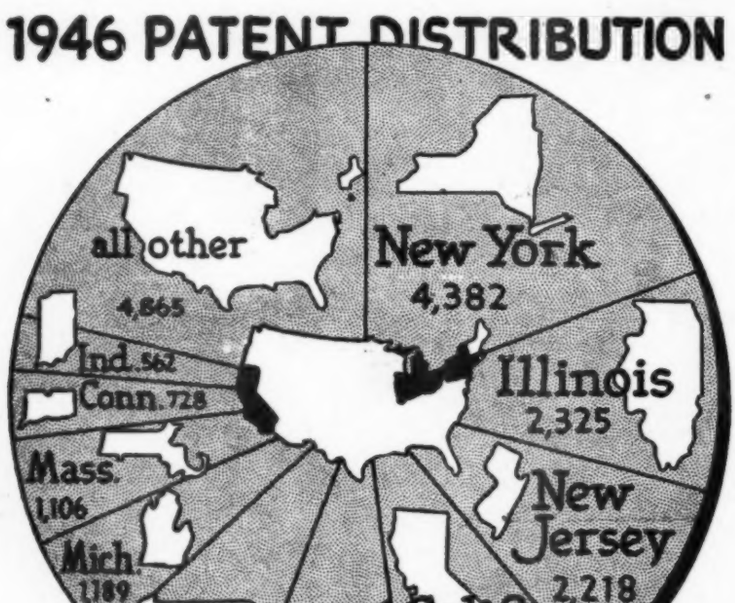
The plastics industry is being realistic in meeting the challenge for improved marketing operations by earmarking substantial sums for research and development. Thermoplastic materials are in much better supply now than during the early months of this year. There is ample injection-molding capacity to meet demand. Thermoplastic sheet, rod and tube fabricators are feeling the change from sellers' to buyers' market. Manufacturers of thermosetting plastics, on the other hand, are plagued with material shortages.

Huge Demand for Presses

There is no slackening in the demand for power presses. While hydraulic and mechanical presses have been turned out at a record rate this year, the backlog of orders continues to mount. One firm reports its present export volume as the largest in its history. Another company is "swamped" with inquiries about medium- and small-sized punch presses. While the material supply situation is held satisfactory, there is some uneasiness over inability to establish a reasonable inventory of component parts.

Farm Implement Exports Up

Export demand is almost certain to continue to be a pillar of strength that supports both farm and industrial production. Exports may run as high as $15 billion. Farm implement makers have raised their business estimate for the year from one billion dollars to one and a quarter billion. Swelling orders from abroad account for the upward revision.



'46 Patents Drop 17%—Patent distribution last year was practically the same as it was in the preceding year, with the industrial states of New York, Illinois and New Jersey providing the greatest number of inventors. California advanced from fifth place in 1945 to fourth. The small volume of patents (22,982) is claimed to be due to unprecedented volume of applications and lack of personnel

Pease Reports Machine Tool Show Reservations Continue Pouring In

CLEVELAND—With a steady flow of inquiries surpassing even the most optimistic anticipations, the 1947 Machine Tool Show is drawing the interest of business and industry leaders everywhere. Exhibit space for the show, scheduled to be held Sept. 17-26 at the mammoth Dodge-Chicago plant, is at a premium.

Herbert H. Pease, association president and president of the New Britain Machine Co., is enthusiastic about the flow of advance registrations. They are coming in large numbers from throughout this country and from foreign countries, with a particularly heavy registration from South America.

With "More Goods for More People at Lower Cost" as its theme, the show will feature more than 1,000 machine tools and related equipment and appliances in actual operation. It is evident the show will be "the world's greatest machine shop."

220 Types to be Shown

The association reports there will be some 220 types of machine tools made in the U. S., with additional variations and sizes of each type, and combinations of various types, especially along the line of special-purpose machines designed for mass-production techniques. To these will be added forging machines, various types of metalworking equipment, appliances and accessories.

Latest developments in the metalworking industry will keynote the Machine Tool Congress, to be held concurrently with the show. K. H. Hobbie, president, Chicago Technical Societies Council, is president of the Congress. Nine important associations will participate in arranging the program of speakers.

Participating Groups

Included are American Bolt, Nut and Rivet Manufacturers Association; American Foundrymen's Association; American Machine Tool Distributors' Association; American Society of Mechanical Engineers; American Society of Tool Engineers; Chicago Technical Societies Council; National Electrical Manufacturers' Association; Society of Automotive Engineers.

Assignment of space has been completed by the show committee headed by Swan E. Bergstrom, sales manager, The Cincinnati Milling Machine Co. More than 250 American manufacturers are represented.

Other show committeemen are: William L. Dolle, pres., The Lodge & Shipley Co.; R. W. Glasner, pres., Clearing Machine Corp.; Helge G. Hoglund, v.p., Van Norman Co.; Ralph J. Kraut, pres.; Giddings & Lewis Machine Tool Co.; Donald M. Pattison, v.p., The Warner & Swasey Co., and Louis Polk, pres., The Sheffield Corp.

Chicago Committeemen

The Chicago committee includes:

Kenneth H. Hobbie, president, until June 30, of the Chicago Technical Societies Council, who is also president of the board of directors of the Machine Tool Congress, which will be held in conjunction with the Machine Tool Show. One of the highlights of the Congress will be an Overseas Dinner

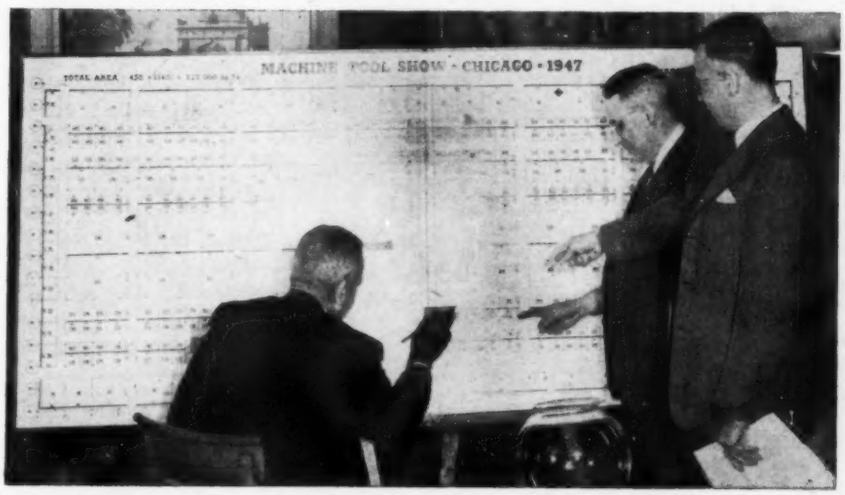
chairman, Rudolph W. Glasner, pres., Clearing Machine Corp.; vice chairman, George Habicht, pres., Marshall & Huschart Machinery Co.; Edward K. Welles, pres., Charles H. Besly and Co.; A. G. Bryant, v.p., Cleereman Machine Tool Co.; Harold B. Smith, pres., Illinois Tool Works; Norton A. Booz, pres., Federal Machinery Sales Co.; M. J. Wiora, v.p., Bryant Machinery & Engineering Co.; E. Porter Essley, v.p., E. L. Essley Machinery Co.

Registration Committee — Chairman, Helge G. Hoglund, v.p., Van Norman Co.; T. B. Buell, sales mgr., Sundstrand Machine Tool Co.; Kirke W. Connor, pres., Micromatic Hone Corp.; E. Blakeney Gleason, v.p., Gleason Works; Frank Moran, v.p., and sales mgr., The Carlton Machine Tool Co., and Robert R. Rhodehamel, gen. sales mgr., The National Acme Co.

Farm Implement Exports Rise As Domestic Demand Slackens

CHICAGO—Farm implement makers in the Chicago area, after reviewing the peaceful labor situation and the somewhat easier materials picture, have revised their sights upward. A few months ago they were predicting a billion dollar farm machinery year; now they expect a total for the industry to run to one and one-quarter billions.

This optimism is evident despite signs that the frantic rush of farmers for machinery is slackening. The answer to this paradox is that export sales, below normal last year, are picking up, and foreign sales will be strong for a long time to come, the industry believes.



Drawing for Machine Tool Show Space—Space selections for the forthcoming September machine tool show were made recently with (l to r) Truman L. Clapp, Clapp & Poliak (show managers); Ray F. Ingram, vice president, The Landis Tool Co., who drew the slips from the goldfish bowl; and Hugh Robinson, Cleveland district sales manager for the Monarch Machine Tool Co., participating

Chances for New Labor Legislation Brighten as Congress Fuses Bills

WASHINGTON—Chances for new labor legislation replacing the 12-year-old Wagner Act brightened as the Senate-House conference committee undertook to fuse the Taft and Hartley labor bills into one.

▸ Inasmuch as both bills go beyond last year's Case bill, it is generally accepted that Truman again will slap a veto on the final version. The big question, then, is whether the Senate can muster the two-thirds majority necessary to override. It's a cinch that the House, which passed the Hartley bill by 308-107, can, and will, do it.

Veto Views Altered

Observers who had predicted that the Senate could not upset a veto changed their view after Sen. Robert A. Taft surprisingly rolled up 68 votes behind his bill, with only 24 against.

▸ It is expected that Democrats like Lucas of Illinois, Sparkman of Alabama and a few others who voted for the Taft bill will switch to support a Truman veto, if it comes. If the final bill is considerably stronger than the Taft measure, still others like Ives of New York, a Republican, might drop their support, in which case chances of enacting a law over Truman's disapproval would be slim.

Compromises Prepared

Thus, the odds of getting new labor legislation may very well depend on how much the measure Truman gets resembles the bill passed by the Senate. Recognition of this prospect was indicated by Rep. Fred A. Hartley, Jr., of New Jersey, chairman of the House labor committee and one of the conferees. He said the House leaders were prepared to drop the ban on industry-wide bargaining and some other provisions not in the Senate bill if they meant the difference between getting some new law or none at all.

Fabricator Protection Defeated

By the narrow margin of 43-44, the Senate refused to include in its bill a Taft amendment intended primarily to protect steel fabricators and all sorts of employers having contracts with Phil Murray's United Steelworkers, CIO, from being compelled to follow the basic steel wage pattern.

▸ This was not a ban on industry-wide bargaining, although that is what it was tagged. Actually, the amendment merely would have prevented international unions from dictating contract demands to locals, such as the Steelworkers Union did last year in imposing the 18½¢ pattern on all employers irrespective of their financial position and the nature of their product. Unions and industries could bargain nationally if they liked.

Ives Fought Amendment

The fight against this amendment was led by Ives, who felt it would contribute to a breakdown in union discipline and possibly add to labor strife. He favored more study of the subject.

▸ The House provision would strictly forbid industrywide bargaining by competitors.

Provisions of Bills

Both Senate and House bills contained many provisions which were similar and likely to remain in the joint product that finds its way to Truman's desk. They include:

- 1. Closed shop ban, with union shop permissive when workers favor it.
- 2. Denial of legal protection to foremen's unions.
- 3. Use of injunctions, available to the government only against secondary boycotts, jurisdictional strikes and strikes affecting public health, safety or welfare.
- 4. Unfair labor practices by unions.
- 5. Free speech on both sides.
- 6. Unions sueable for breach of contract.
- 7. Financial reports by unions.

Portal Act Reasoning

Truman sought to take the political ball away from Republicans when he signed the Portal-to-Portal Act of 1947 and asked Congress to push the 40¢ wage minimum up to 65¢. He knew Congress was sure to override a veto. Now, if he vetoes the comprehensive labor control bill yet to come, Truman can use the portal pay signature as an answer to any charge that he is opposed to all measures regulating union activities.

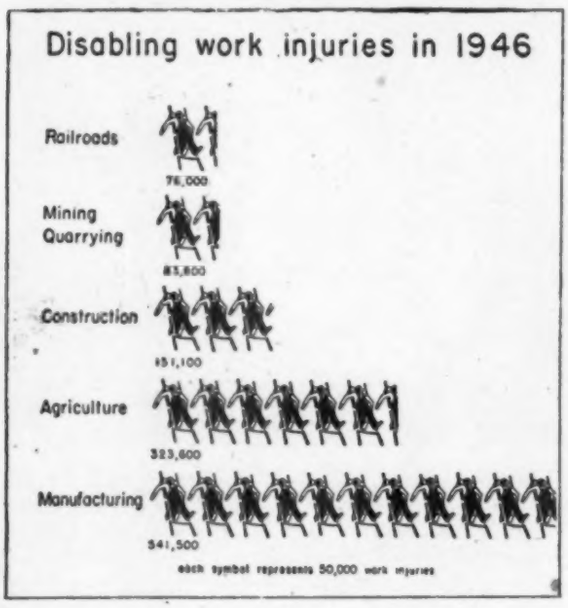
▸ Major effects of the new law: It limits any wage claims to two years, wipes out pending suits and outlaws future claims based on activities not compensable by contract, custom or practice; protects employers who follow government rulings in good faith. Double damages are no longer mandatory.

Plant Police Decisions

Unless a provision like that in the House labor bill classifying plant police as supervisors becomes law, employers will have to bargain under the Wagner Act with unions of plant guards.

▸ Under two recent Supreme Court decisions, involving Jones & Laughlin Steel Corporation's Cleveland plant and E. C. Atkins & Co., Indianapolis tool and armour plate makers, this is the law even if the guards are militarized or deputized as law officers. It makes no difference, either, if they belong to the same union which represents the production workers, although they normally are placed in separate bargaining units.

▸ The Supreme Court majority in each case upset lower court rulings which, in the Jones & Laughlin case, held that guards should not be in the same union with production workers, and, in the Atkins case, found that they were not "employees" under the Wagner Act.



Work Injuries Rise—A recent report of the Bureau of Labor Statistics shows that on-the-job accidents in 1946 rose to over 2,000,000, ending a two-year downward trend. BLS estimated that 47,000,000 work days were lost during the year, or the equivalent of full-time employment of 156,000 workers. About 16,500 workers died from injuries received, while another 94,900 were permanently impaired—1,800 of which are unfit for future industrial employment

Detroit

COMPLEX POSTWAR DIES INCREASE COSTS...STUDEBAKER DESIGN WINS ACCEPTANCE...COLD-FINISHED STEEL BEGINS TO LOOSEN

Complicated Dies Raise Cost

Much has been heard about the greatly increased costs of tooling for automobiles or other manufactured goods. Tool and die men, however, say there is much more to the picture than simply the higher prices they are forced to quote, because of higher hourly rates.

On automobile dies, for instance, the requirements which have been placed in past months and which will be placed in the future are much more complicated than prewar dies. Deeper draws add to problems of the die maker. In many cases automatic ejection of stamped parts is specified. One expert in this field figures that at least half of the percentage of increase in die costs can be attributed to these complications.

In addition, automoblie companies figuring their die costs are adding into them the much higher labor rates paid for modelers, molders, and pattern makers along the line before they reach the die makers.

Automotive Design Trend

On the score of die work a fairly general anticipation of the look of 1948 models is now possible, based on the work done for them a year ago, when they were intended for use in 1947 lines and upon recent releases.

Those 1948 models to be importantly changed will follow the Studebaker - Kaiser-Frazer-Packard Clipper design tendency. They will be low and round, and will have the look-in-two directions appearance of the Studebaker.

Glass areas will be enlarged. Windshields will be curved not only from left to right but also from top to bottom—something, incidentally, which caused a considerable to-do in redesign of windshield wipers before that riddle could be unraveled.

Very little tool and die work is out. A few scattered shops are shutting down entirely in the Detroit area on this account, and the others continue to coast along very slightly in excess of 40 hours a week. These shops see little likelihood of more volume for quite a while ahead. Indefinite postponement of the Chevrolet light car project has been a blow to tooling shops.

Strike Effect Forms Pattern

The drive of the automobile industry for higher production bogged down badly early in May when the effects of the week-long Inland Steel strike caught up with the hand-to-mouth supplies of sheets in the stamping shops. One plant after another toppled over for periods from a day to a fortnight, and volume fell from its 100,000 unit a week level down to 82,881 cars and trucks.

By mid-May the worst of the setback was over but the nearly instantaneous effect of the Inland strike amply pointed a pattern for the future. If another blockade occurs in sheet metal, or any other short material, output schedules will be similarly affected.

Castings, Forgings Tight

Castings and forgings continue tight along with sheet steel. And there is little sign of relief.

The first faint loosenings in the entire steel picture are appearing in cold-finished stock. This branch of the industry always had a considerable amount of capacity. Many users bought ahead and have now pretty well caught up. Cold-reduced steel, therefore, is becoming available here and there. It finds its use in the automobile industry in a variety of motor parts, in drive shafts, in some rear axles and in odds and ends of items. One effect of this availability has been to switch some work from cold heading machines onto screw machines.

Human Engineering at Ford

Some of the much-discussed human engineering at Ford Motor Co. is being manifested in the employment departments at River Rouge. Business at the hiring desks is becoming more personalized.

Applicants are seated at desks and questioned privately by interviewers with the aim of combining man and job in the most efficient and satisfactory manner. Toward that end the applicant's background is checked more thoroughly than in the past and he is told a great deal more about Ford's workings.

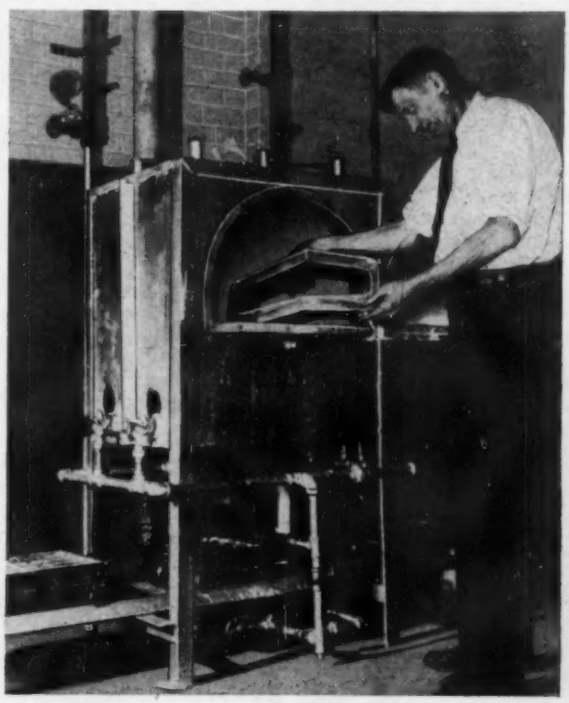
After new men are hired they are taken to a lecture room in groups from 5 to 100 and given a thorough explanation of company policies, physical set-up and other matters. Each man is shown how he fits into the entire production picture. If he has questions, he is free to ask them.

Whether from human engineering or other reasons, turn-over at Ford has dropped quite a bit from the 1946 level. The average monthly turn-over rate, including both separations and lay-offs, stands at 2.15% for the first four months of 1947. During 1946 the average monthly rate was 3.5%.

Labor Turn-over Lessens

This 1947 showing may be somewhat better than many other Detroit area industries, but all plants in Detroit have shown some reduction in recent months in turn-over and the rate is back close to prewar levels, if not equivalent to them. This is somewhat surprising in the light of constantly increasing payrolls in manufacturing establishments, relieving the pressure on men to stay put in their jobs.

Die Patterns Saved—The oven recently reported *(AM, May 8, p. 157)* in use at Fisher body division to reclaim Wood's metal by melting it out of pattern faces is shown here, along with its developer, Joe Miller, supervisor of the heat treat, blacksmith and welding department at the Die and Machine plant in Detroit. The oven is made out of scrap materials, and heats by gas to 180 deg. level at which Wood's metal melts out. Formerly it was chopped out, leaving about 30% in the anchor holes and ruining the patterns for future use



Leasing of Standby Plants to Firms Sought by Army-Navy Joint Bill

WASHINGTON — The Army and Navy are convinced that leasing standby plants and having them maintained by private operators is the best policy. A joint proposal went to the Senate Armed Services Committee recently as S-1198 with an analysis by Robert P. Patterson and W. John Kenney, Secretary and Acting Secretary for Army and Navy. They submitted lists of war-built plants they want to farm out.

Arguing that the 18 months or two years necessary to convert commercial plants for emergency might mean the difference between success and disaster, the services say they would give all qualified operators a chance to rent the plants, but would chose those who would manufacture articles most similar to wanted war goods.

Lease Period of 5 Years

Standard lease period would be five years but the Secretaries would give longer terms on less attractive properties involving greater risk of lessee investments. Leases would prohibit structural alterations which would impair war production and require maintenance to keep the plant in good condition.

Departments ask authority to transfer from RFC and from WAA a reserve of machine tools. Totals called for in this program are previous to the current JANMAT program which may be included in the over-all reserve.

The joint request calls for authorization of appropriations to cover administrative expenses and to maintain plants which cannot be leased.

Army wants to expand its present arsenal system from 15 to 17 plants, and keep 43 other standby plants including 29 for ordnance material, 13 chemical, and one for experimentation on fuels. Only one of the 43 is RFC-owned.

Of 270 plants operated or sponsored by Army in 1944, all but the arsenal system of 17 (not for commercial use), and this rent program are in surplus or will be.

Army Equipment Plans

Army proposes to retain 48,434 machine tools, 8,729 machines for metal forming and stamping, and 719,233 other production items, including dies, fixtures, instruments, etc. Of the latter total, about 31,600 would come from RFC, but acquisition of 5000 additional RFC items is recommended.

The Navy, aiming at expansion from 500,000 to 3 million personnel within less than a year in case of emergency, wants to lease out 34 plants (including 7 from RFC) whose annual maintenance otherwise would cost an estimated $5 million. Navy says it will first try to sell the plants under the National Security Clause, already in use by Army, Navy, RFC and WAA, requiring purchasers and lessees to maintain them for war production.

Navy wants 35,000 items of machine tools and production equipment, of which 24,000 are owned by RFC. About 7000 units would be used immediately for modernization.

Los Angeles Steel Prices Cut By U. S. and Columbia Steel

LOS ANGELES—U. S. Steel Corp. and Columbia Steel Corp. have reduced Los Angeles prices of steel products.

The Los Angeles price of structural steel shapes made at Geneva has been cut by 23 cents per 100 lbs. by U. S. Steel, making it $3.14. The new price on plate moving from Geneva to Los Angeles is $3.36, a reduction of 16 cents per 100 lb. An Eastern-based price had been in effect for products of the Columbia Steel Corp. mill at Torrance, Calif., sold at Los Angeles. However, Columbia has designated Los Angeles as the basing point for prices on Torrance mill products.

Machine Tool Sales Leveling Off; Surplus Items Threat Seen Removed

CLEVELAND — Machine tool builders in the Cleveland area are of the opinion, generally, that the downward trend of their industry has started to level off and that the days of uncertainty are more or less over. The great fault the builders are finding with the leveling off is that it evened out at a level below their hopes and expectations.

If new orders placed during April (preliminary estimates sets the figure at $18,167,000) is a criterion, and it appears to average out well for the business placed during the past three months, then the annual machine tool sales figure will hover close to the $225 million mark for 1947 instead of the hoped and predicted figure of $300 million.

Business Stimulant Viewed

Builders see a number of favorable aspects to the present situation of their industry, not the least one being the excellent chance for enactment of fair labor legislation which they expect and believe will be a stimulant for business generally. Another ray of hope is the confirmed belief that WAA is no longer a competitor of the machine tool building industry.

Events of the past several months have demonstrated clearly that WAA has just about run its course insofar as any serious cutting into the manufacture of new machine tools. What damage the WAA could do, many of the Cleveland area builders believe, has been done, and the tools now remaining in the hands of WAA for sale will be so completely obsoleted by the new tools which will make their appearance at the machine tool builders show in Chicago, Sept. 17-26, that they will no longer be a factor.

Material Shortage Hampering

The present pace of machine tool buying would be accelerated considerably, local builders are led to believe by potential customers, should supply of material to metalworking plants be more satisfactory.

Extremely short in many factories is hot-rolled sheet and strip steel. Cold-rolled sheets and strips appear to be in greater abundance. Copper is another material that is short in supply. Should the supply of material improve to any extent, a fair labor law enacted, and labor really set itself to the job of production, then Cleveland machine tool builders are practically unanimous in their opinion that new orders for machine tools will follow along rapidly.

NMTBA Cites Figures

Concurring in that belief are the staff members of the National Machine Tool Builders Association and they have the figures to back up their assertions. Such figures show, that contrary to popular belief, the machine tool building industry follow closely to the economic line of general industry.

What does do real damage to the industry is the fact that where industry as a whole can show a gradual declining line to a slump of reasonable depth, the machine tool industry falls into a pit as deep as the Grand Canyon.

August H. Tuechter

Tuechter, Machine Tool Authority, Former NMTBA President, Succumbs

CINCINNATI—Recognized as a dean of the machine tool industry, August H. Tuechter, president of the Cincinnati Bickford Tool Company, Cincinnati, died May 17. His passing brings to a close a long career, epitomizing the American concept of a "self-made" man.

From its inception in 1902, Mr. Tuechter took an active interest in the National Machine Tool Builders' Association. He served as second vice president from 1915 to 1918 when he was named first vice president. Serving in the latter capacity for two years, Mr. Tuechter was elected association president in 1920 and served until 1922 when he assumed the post of treasurer for one year. He reassumed the treasurership in 1928 for another term.

Reviewed Association's Founding

His interest and work in behalf of the association and the machine tool industry itself were credited with contributing to a better understanding of the industry and to its progress.

At the 25th anniversary of the National Machine Tool Builders' Association's founding, Mr. Tuechter outlined events in its growth. He described how the association helped to iron out bitter rivalries and led to united effort in placing the industry in a favorable position in the nation's business.

He was also past president of the Cincinnati Army Ordnance Association, past president of the National Metal Trades Association, and a member of the American Society of Mechanical Engineers, and the Engineers, Queen City, and Cincinnati clubs.

Started as Bookkeeper

Born in England, Aug. 15, 1869, Mr. Tuechter came to this country at an early age. He attended public schools and took a course in the Nelson Business College, which prepared him for his first job as bookkeeper for the Hoefinghoff & Lane Foundry Co.

In 1887, Henry Bickford sold the upright drill business he had founded to the Bickford Tool Co., organized by Charles Hoefinghoff. Mr. Tuechter became associated with the new firm and some 12 years later was named general manager when the company was reorganized under the name of Bickford Drill and Tool Co.

Upon Mr. Hoefinghoff's death in 1898, Mr. Tuechter entered partnership with Sherman C. Schauer and formed the Cincinnati Machine Tool Co., specializing in upright drilling machines. In 1909 the Bickford Drill and Tool Co. consolidated with the Cincinnati Machine Tool Co., under the name of the Cincinnati Bickford Tool Co. Mr. Tuechter was named president and retained that post until his death.

Mr. Tuechter was energetic in business, but found time for wide travel abroad. He served as vice president of the Oakley Bank, director of the Norwood Bank and of the Ahrens-Fox Fire Engine Co., and the Century Machine Co. He was director of the Lincoln National Bank, vice president of the Cincinnati Rubber Mfg. Co., and secretary of the Factory Power Co.

Chicago Metalworking Companies Offer Resistance to High Prices

CHICAGO — Metalworking firms in the Chicago area in general are exhibiting extreme caution and careful analysis in their purchasing activities, as they look forward to a slight slackening of business. Backlogs are decreasing to some extent, and faster deliveries from suppliers make long-term commitments unnecessary in many lines.

Resistance to high prices asked by parts makers and raw material suppliers is increasing. At the same time executives of metalworking firms say that if a recession in business develops, it will be caused by the high prices they are forced to charge as a result of record-high costs of labor and materials.

Overexpansion Cited

While the great majority of company officials say high prices are the chief danger, significantly several metalworking men now declare that "overexpansion and overproduction" will hurt business later this year. They admit, of course, that this problem is only an aspect of the price question.

A survey of purchasing agents showed that, with very few exceptions, advance buying is being limited to 90 days and in a large proportion of companies, to 60 days.

In general, however, makers of durable consumer goods and of production machinery are less worried about the future than are the companies producing "gadgets" of one sort or another. It is also evident that many war-born firms are finding the going hard in civilian markets. In addition to their troubles with suppliers of scarce materials, they are finding that sales outlets prefer old established brands.

Foreign Report

(BASED UPON REPORTS FROM McGRAW-HILL WORLD NEWS BUREAU)

USSR Speeds Heavy Machines

MOSCOW—Plants under the control of the Ministry for Heavy Machine-Building will, this year, considerably increase output of metallurgical equipment, steam turbines, boilers, traction and Diesel engines, and cranes, stated V. F. Zhigalin, Deputy Minister.

The Ural Machine-Building Plant which has now reached its prewar production mark, he elaborated, is to produce this year the principal equipment for six blast furnaces with a capacity of 46,000 cubic feet each. The equipment will include pig-iron-carriers, pig machines, charging apparatus, skip hoists, etc. In addition the plant will build a rail and structural steel mill and various blooming-mill parts.

Productivity Increased

The new machines designed and produced at present greatly differ in quality from similar equipment turned out before. They are in line with the latest technical developments. Productivity of new excavators is 20% higher than of those produced before the war. The design of the rail and structural steel mill to be produced by the Ural Machine-Building Plant provides for complete mechanization of all production processes, whereas more than 30% of the operations on similar imported mills are done by hand.

The Novo-Kramatorsk Plant in the Ukraine is producing high-capacity cranes and parts for various machines this year. It will put out a total of tens of thousands of tons of various machines, including mining machinery capable of handling millions of tons of coal and ore.

Billet Mill Planned

A billet mill for the Transcaucasian tube works, as well as a number of flattening mills, are to be produced this year by the Novo-Kramatorsk Plant.

Various electric machinery of new design is to be produced, including 102,000 hp. hydroturbines, to be put out by the Stalin Metallurgical Plant in Leningrad.

The boiler plants are turning out various equipment for the oil industry and electric stations, including oil-refining equipment, high-pressure boilers and new solid-forged transportable boilers for the oil-mining industry.

British Goods Bound For South America—A wide range of agricultural machinery for display in South America left London last month on the merchant vessel, St. Merriel. A selected group of smaller implements from Dening of Chard is shown above as it was set up on the ship for display during the cruise

Steel Recovery in Russia

MOSCOW—The southern iron and steel industry in the USSR which suffered great damage during the war is making strides toward recovery. Out of a total of 36 blast furnaces, 73 open-hearth furnaces and 61 rolling mills in the southern regions earmarked for restoration by the end of 1950, as many as 25 blast furnaces, 67 open-hearth furnaces and 46 rolling mills were back in operation by the beginning of this year. Their reported monthly production amounts to hundreds of thousands of tons of iron and steel. The following table shows the increase in 1946, as compared with 1945, in the production of pig iron, steel and rolled steel achieved in Russia as a whole and in the southern regions of European USSR.

	Total Increase	*Increase in the Southern regions*
Pig Iron	12%	59%
Steel	9%	67%
Rolled Steel	13%	57%

Most of the outfits under restoration are simultaneously undergoing reconstruction, resulting in the increase of their efficiency and of the mechanization of production processes. This year the restored southern metallurgical plants are expected to reach their prewar capacities.

Poland Makes "Token" Exports

WARSAW, POLAND—Working industriously toward rehabilitation, Poland is making a concerted effort to re-enter international trade. Significant is an announcement that "token" quantities of machine tools will be exported from Poland this year. Machinery earmarked for export includes lathes, borers, planing machines, grinders and woodworking machinery.

Machine tool production is concentrated in the northern part of the country, primarily in Poznan, where the Cegielski Machine Tool Works employ 2000 persons, and the Pruszkow Works, near Warsaw, employing 700.

The 1946 output of machine tools is estimated at 1,500 units, exceeding the country's prewar production. Poland's acquisitions in the Western territories are making an important contribution to the country's reconstruction.

Advisory Chairman Named

LONDON—Sir Charles McLaren, K.C.B., has been designated by the Minister of Supply as chairman of the Gauge and Tool Advisory Council, succeeding S. F. Steward, C.B.E., who resigned. The latter was formerly director-general of Machine Tools in the Ministry. Sir Charles continues as director-general of the Ordnance Factories.

Washington

MAPI CITES PRICE TREND...NAVY ACTS TO SPLIT SURPLUS WAR PLANTS...ALL-OUT WAA PROBE DEBATED BY CONGRESS

Steel Stymied Truman

President's effort to talk prices down was defeated mainly by inability of steel to go along with him. You will hear very little more about it. But White House economists claim credit for heading off price boosts that might have followed recent wage hikes.

Machinery and Allied Products Institute says prices stayed up 15 years after War I and does not expect early declines now. With capital goods prices still 50% above 1939, depreciation is still figured at prewar dollars. "Erosion of real capital" not accordingly offset by depreciation is estimated at $1 billion a year for corporations alone. Result is proportionate overstatement of profits.

Korean Aid Sought

State Department wants $200 million aid program for Korea, which needs rails, rolling stock, boilers, irrigation pumps, and other equipment. Of 28 million Koreans, 19 million are in the U. S. zone but major resources are in Russian zone. This aid program would be a U. S. outpost between Russia and Japan. You'll hear more about it.

Shipbuilding Dilemma

U. S. Merchant Marine will have to be bailed out again as it was in 1936 by the Maritime Act. A White House committee and the House marine committee are looking for a solution.

This country is building only 5.8% of 996 ships on ways throughout the world, 54.3% of them in England.

We had 4800 vessels at war's end; 1200 have been sold abroad and at home. But war types can't compete against new construction. Most wartime ships will go in reserve which eventually will total 3750. U. S. has only one first class passenger ship—the America.

Glaring weakness in U. S. marine future is air competition. Shiplines' demand for right to fly planes will be decided in connection with, and be strongly affected by, the ultimate marine rehabilitation program.

Navy Splits Plants

Purchasers of Navy war plants now can get what they want without unusable portions. Navy still holds 88 plants and WAA still has 181 declared surplus by Navy. The 20-year security clause has not been changed. Best properties are gone, and Navy, Army, RFC and WAA find their holdings harder to sell.

Navy's offer to split facilities is separate from the joint Army-Navy call on Congress for authority to withhold from surplus and lease out to private operators 77 war plants. They admit they've started preparations for the lease program, to be completed in six months—also that some plants will find no takers, and will have to be maintained idle with funds to be authorized by Congress.

Mechanical Standards in China

As part of its foreign program, State Department sent Dickson Reck to complete a Bureau of Standards in China. It's under Chinese Standards Committee, which has mechanical, electrical, and 8 other subcommittees. Every trade had different measures in every locality. Average foot was made 1/3 meter; average pound ½ kilogram; average gallon 1 liter. Mr. Reck explained to AMERICAN MACHINIST this was the "one, two, three" or interim system, leading to nationwide use of metric, which is already used by government and modern industry. Bureau has promulgated 60 American mechanical standards.

Jet Plane Supremacy

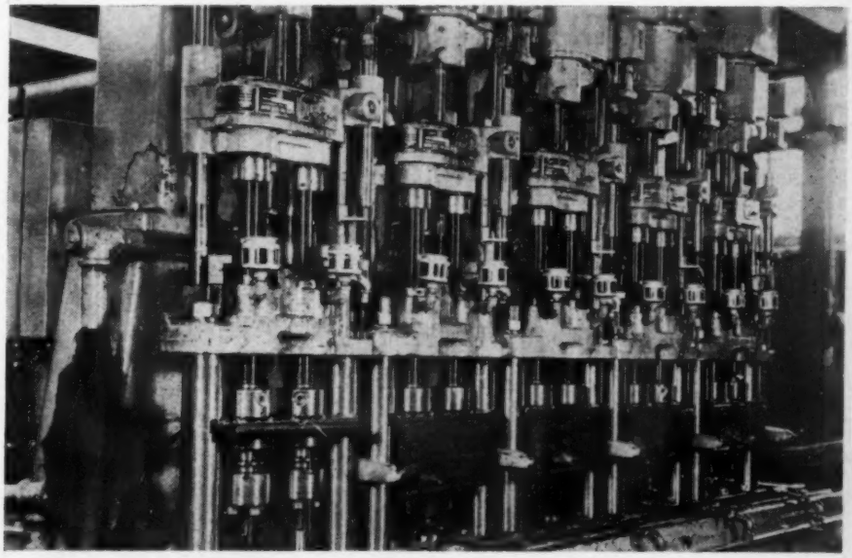
Only recently have U. S. jet engine builders been able to offer Army and Navy performances equal to those of the British, whose records in the field U. S. industry is determined to outdo. British supremacy was in long duration between overhauls, which they gained by actually running more engines. Americans are catching up through military development orders. Experience here in turbo-jet and jet-prop bombers will help catch British lead in like-powered heavy transport.

JANMAT Tagging Slows Scrap

Tagging machine tools for JANMAT (Army-Navy Joint Machine Tools) reserve is holding up withdrawals by War Assets for badly needed scrap. Withholding for giveaway to schools, who still show little interest, is another impediment to channeling surplus to scrap.

WAA Investigation Possible

Two developments tempt Congress toward an all-out probe of the War Assets labyrinthian tangle of second-hand wares and unbalanced records. One is discovery of over $60,000,000 worth of un-invoiced machine tools at Cleveland. The other is testimony on the Hill by a WAA-hired accountant that the agency charges itself enormous debts it doesn't owe, and cannot find what it owns. Where there's so much opportunity there must be some fraud. If WAA escapes it will be because Congress is harried by labor, taxes, and heat—and wonders whether human savvy is equal to the job anyway.

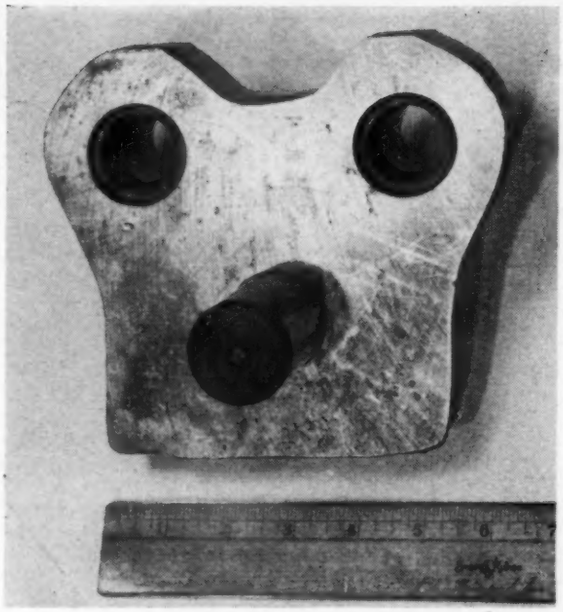


Simultaneous Threading—An increase in productivity has been attained by simultaneous internal and external threading of large steel bushings by Detroit Tap & Tool Co. in producing some 1100 threaded parts per hour for shock absorbers, knee action assemblies, etc., on a 10-spindle multiple drill press

Liquid Nitrogen Sub-Zero Cools Parts for Expansion Fitting

Inert material replaces wartime liquid oxygen for inserting components such as cylinder liners. Cooling machines developed also

BY E. J. TANGERMAN
MANAGING EDITOR



Heat-treated post and bushings in this die set were inserted by expansion fitting, without distortion or damage to hardness

HIGH-PURITY liquid nitrogen, with which a temperature of –320 F. can be obtained, is now available commercially for expansion fits.

Almost two decades ago, I described initial applications of what we then labeled "expansion fitting." Solid carbon dioxide in acetone cooled to –110 F., liquid air to about –300 F. With the former, "compound fits"—in which the outer, or female, member was heated in boiling water to 212 F.—were possible to attain almost as great a differential as with the latter—if the outer part were of reasonable mass and material.

The great advantage of expansion fitting, however, lies in the job which has a heat-treated, complex or large-mass female part, readily distorted by heating. It is a maxim of fitting that heating is always cheaper than cooling—unless the parts are very dissimilar in mass or heat will cause trouble. Such fits as valve tappet guides and seat inserts, cylinder liners, and internal elements that go into heat-treated and finished elements are the exceptions to this rule. One company, for example, relines cylinder blocks by expansion-fitting liners into cylinder bores.

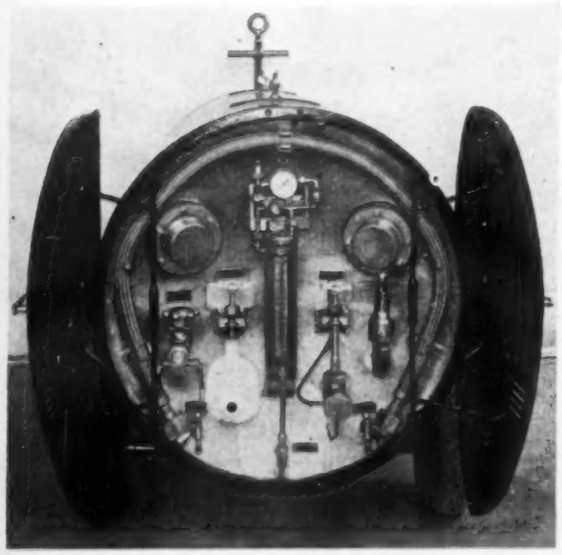
The Linde Air Products Co. has developed both carrying and storage containers and the typical sub-zero shrinking machines here shown.

Normal Jobs Simple

Normal expansion-fit work requires only simple equipment and relatively little nitrogen. Amounts of 5, 15, 25, 50 or 100 liters can be delivered in a Purox container—simply a vacuum-insulated vessel with a spout. Larger amounts are handed in vacuum-insulated 100-gal. mobile tanks. The nitrogen can be poured from the container as required — provided due precautions are taken to advoid splashing, with its attendant waste and danger of "burns" for the operator.

Larger Carriers

The 100-gal portable tanks are equipped with self-contained filling equipment because they normally serve large-production sub-zero shrinking machines. A limited amount of nitrogen is bled off into an external heat-exchanging coil, where it is vaporized to raise pressure over the liquid in the tank to about 5 lb. Thus liquid can be quickly forced from tank to machine.



Large supplies of high-purity nitrogen may be transported and stored in this 100-gal., 4-wheel transfer tank. Vacuum-insulated, it incorporates an external coil for developing transfer pressure

Simplest of using devices for liquid nitrogen is made up from a stainless-steel bucket. A 4½x8-in. pot is set within it and surrounded by insulation. The cover is turned wood. Parts are handled either with tongs or with the ladle shown. Liquid nitrogen is simply poured into the pot as needed

Equipment

A variety of machines have been developed, all utilizing the cold vapor for precooling parts, allowing vapor to flow counter to part movement. Precooling with vapor permits the full use of the refrigerating value of the nitrogen.

Some types keep the part from contact with the liquid, others permit direct immersion. Essentially, the liquid nitrogen boils in a closed tank, the gas normally being exhausted to atmosphere by passing over the parts.

The simplest device is a stainless steel bucket containing a well-insulated internal container. This container is about 1-qt. size and is topped with a wooden lid containing vent holes and accompanied by tongs or a perforated ladle for handling parts.

Initial machines had horizontal tubes, as many as eight side by side. In one type, parts were fed in through a tube, and released as needed through a trap door at the inner end, to slide down through a chute by gravity to the delivery tray. With such a unit, valve tappet guides were delivered at over 200 per hr.

More recent types contain a parts-cooling tube, which is essentially an inverted "U" extending into the liquid reservoir. The parts to be cooled are loaded at the upper left-hand section of this "U". The operating lever activates a vertical plunger at this section which advances the column of parts one diameter, ejecting a cooled part (which has passed through the high-purity liquid nitrogen), at the upper right section of the "U". This "U" tube contains openings in the container area which allow the liquid nitrogen to come into direct contact with the parts as they progress through the tube. Vapor boiled off is exhausted through the inlet portion of the tube, thereby precooling the parts prior to immersion. In addition, this machine has an auxiliary chamber for chilling miscellaneous, irregularly shaped pieces, which may not be required on a production schedule.

For very high production of small rings, etc., such as valve-seat inserts a machine has been developed which has vertical stacks in series. These pass through the liquid reservoir. The parts to be chilled do not come into direct contact with the liquid; instead all chilling is accomplished by the cold vapor.

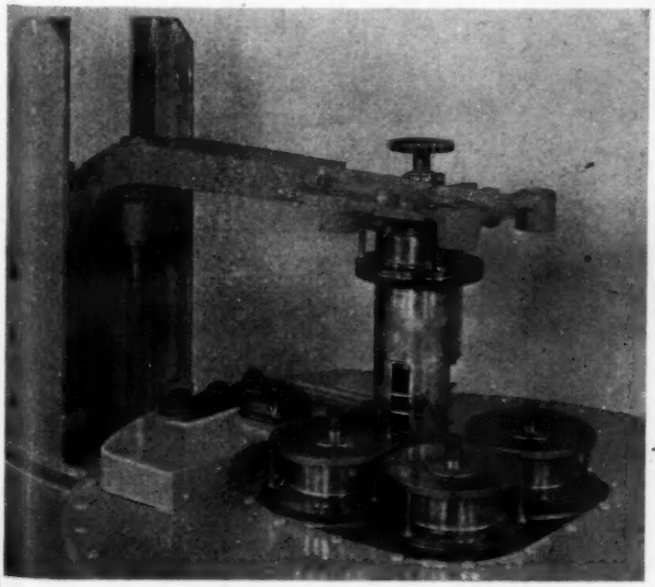
Inert and Non-Toxic

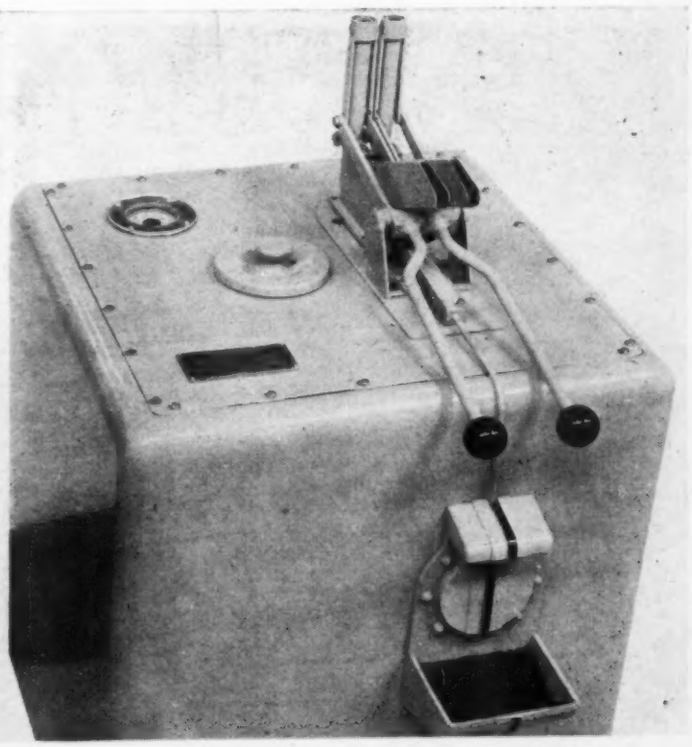
Nitrogen is relatively inert and non-toxic, but concentrations will of course cause an oxygen deficiency so it must not be used in unventilated, tightly enclosed areas. It must also be kept from contact with the skin or eyes because it causes effects similar to a burn. Operators should wear clean gloves and preferably safety goggles. Spilling should be avoided in transfer. None of these is more than an ordinary precaution, however, in handling such materials.

Certain general precautions must be observed, of course. Parts cooled to –320 F. are more brittle than they are at room temperature, so must be handled carefully. The operator must have a steady hand and a sure eye—or the insert may cock and be warmed sufficiently to stick half in and half out. On long work, such as cylinder liners which may be 6 to 8 in. long, it is common practice to use a guide.

Note: *Technical details on calculating characteristics, consumption and fit calculations appear as a Reference Book Sheet on pages 151 & 153.*

Typical of more elaborate sub-zero cooling equipment is this counterflow unit for parts such as valve-seat inserts. Parts may be fed from hopper or by hand into the two chutes at top. Cooled parts, as needed, are ejected from the trap at lower right by operating levers. Parts are carried in U guides for direct immersion following precooling by gas exhausting through inlet chutes. The cap at top center covers a test well, into which odd-shaped sample or other parts may be inserted for immersion cooling. Filling is done from a pressure tank from behind, where drain valve and trycock are also provided →





← This high-production machine has four vertical stacks, each consisting of 14 trays. Work pieces are placed in trays for liquid-nitrogen cooling. One stack at a time can be indexed, by the overhead boom, to present each tray in turn at the surface, after which a prefilled stack can replace the just-emptied one, to be cooled and emptied in its turn

Automatic Machine Tool Lubrication Urged to Reduce Production Costs

NEW YORK—Machine tool lubrication, brought into sharp focus by round-the-clock war production, was given a major workout by the New York section of the American Society of Lubrication Engineers at their annual dinner meeting at the Midston House. The symposium covered machine tool lubrication from three points of view, the machine tool builder, the lubricant supplier and the user. Consensus of opinion from top-flight executives addressing the meeting was that machine tool lubrication is here to stay—as a science and as an integral concern of production management.

Bearings Reduce Breakdowns

Speaking for the machine tool builders, F. O. Hoagland, master mechanic of Pratt & Whitney Division, Niles-Bement-Pond Co., said the outstanding feature introduced in the field of machine tool lubrication in recent years has been the more extensive use of anti-friction bearings. Twenty years ago, when sleeve bearings predominated, 75% of machine tool breakdown was traced to frozen bearings. Now this breakdown figure has been reduced to less than 1% by the combined attention of machine designers, standards and petroleum engineers.

Development of practical oil grooving in bearings has done much to improve machine tool lubrication. Poor design of grooves was one of the trouble points in machine tool lubrication some years ago. In fact, said Mr. Hoagland, the "figure 8" oil groove in bearings set the art back at least ten years in this country. It was interesting to note that automotive engineers also came to that conclusion and eliminated "figure 8" oil grooves in engine connecting rods.

The speaker praised oil company engineers for development of extreme pressure lubricants which made it possible to obtain precise and uniform table and cross-slide movement in modern machine tools. Advances have been made in assuring continuous lubrication by using circulating, intermittent, splash or fog producing systems, oil pressure switches, permanently greased ball bearings and oil-less bearings.

The speaker felt that classification of surface roughness is an important factor and that the day is not far off when surface specimens will be as common in machine shop practice as gage blocks are at present.

Eliminating Human Error

C. V. Schaefer, main plant superintendent of De Laval Steam Turbine Co., in discussing Mr. Hoagland's paper felt that there were two prime factors in machine tool lubrication—human nature and dirt. He felt it has become logical and safe practice to equip all machine tools with automatic means of lubrication, eliminating chance of human error and omission.

The user, Mr. Schaefer said, is anxious as never before to get complete information on the best methods and oils for lubricating his machine tools but he wants to get it in simple, direct language. There is at the disposal of the user today oils of fine quality and numerous methods of applying them. He wants to be sure that he is getting maximum benefit from both.

Demands of Higher Loads

R. W. Flynn of the Gulf Oil Company, speaking for the lubricant supplier, said correct lubrication has made possible the machine tools of today. "Obviously," said the speaker, "increasing the productivity of machine tools is bound to bring about heavier unit loads on bearings, gears and other component parts at higher operating speeds. Demands which machine tools will be called upon to fill to an even greater extent in the future, namely, greater loads, higher speeds and improved accuracy, mean that correct lubrication of the machine tools is going to be even more important than it has been in the past."

"Production Insurance"

W. H. McKaig, lubrication engineer of International Business Machines Corporation, stated his company considered machine tool lubrication "production insurance." "We are all aware that, with our present-day t i g h t l y coordinated manufacturing schedules, lost machine time is like a disturbing wave that travels clear down the line to the shipping platform. The boom of the resulting breaker is generally well amplified by the customer who didn't get the product in the right quantity, at the right time, at the right place, because the proper lubricant was not applied in the right quantity, at the right time, at the right place. It is remarkable that a silent bit of lubrication which wasn't there could make such a racket."

Cooperation Is Stressed

The speaker outlined problems facing lubrication engineers, even after top management is sold. He stressed close cooperation with other departments such as tool engineering and plant engineering. To make this "production insurance" effective it must be tied in with purchase of new machine tools. New machines going into the line should improve maintenance of production in that they will require less mechanical maintenance through better design, including centralized lubrication systems which will provide safe lubrication for not less than a one-shift interval.

Four-jet Bomber Maneuverable—North American's B-45 four-jet bomber now under test for the Army Air Forces is described as "easy to fly and very maneuverable." Stalling characteristics are reported as excellent, with no tendency to roll or pitch. Controls are operated by a hydraulic "boost" system, which provides 95% of the energy necessary to operate surface controls

800 Steel Executives Attend Institute's General Meeting

NEW YORK—Eight hundred steel executives from all over the country attended the 55th general meeting of the American Iron and Steel Institute recently and heard prominent speakers discuss new techniques, research developments and the future outlook for the industry.

Technical sessions featured papers covering the subjects: raw materials; coke ovens, blast furnaces and steelmaking furnaces; shaping and forming; and general metallurgy.

A highlight of the two-day sessions was an address by Wilfred Sykes, president of the Inland Steel Co., of Chicago, on "The Future of the Steel Industry."

Capacity Held Ample

Mr. Sykes asserted the present annual steel capacity of more than 91 million tons appears ample for the nation's future needs for many years to come. Taking issue with contentions that today's steel capacity was excessive, the speaker voiced the opinion that "our probable real economic capacity is somewhere around 80 million ingot tons per year, which balances up pretty closely with the anticipated demands within the next five or ten years."

Predicting that technological improvements in iron and steelmaking will be evolutionary rather than revolutionary, Mr. Sykes stressed the fact "there must be free interchange of ideas between the men engaged in the industry through formal or informal channels, through the Institute, and such programs as the general meeting." Continued research, he added, will open new fields and lead to new uses for steel.

Mr. Sykes pointed to strong indications the present shortage of scrap will continue for some time to come. He cited the exporting of more than 23 million tons from 1930 to 1940 as a "permanent loss." He asserted a permanent solution is materializing in the increased percentage of hot metal used in open hearths.

High-temperature Alloys

Gunther Mohling, associate director of research, Allegheny Ludlum Steel Corp., reviewed problems involved in the fabrication of high-temperature alloys. In speaking of the manufacture of gas turbine buckets, he said the costs of forged buckets probably could be greatly reduced if forgings could be done on the fast, heavy presses.

Experiments, he said, have proved that a great number of steps can be saved in this way, but the lack of proper die materials has so far prevented the practical use of this method.

Names in the News

W. F. Hosford

William F. Hosford has resigned as director and vice president in charge of operations of Western Electric Co. after 47 years with the company. At the same time, **Stanley Bracken,** vice president in charge of manufacture, was elected executive vice president, while **H. C. Beal,** engineer of manufacture, was elected director and vice president to succeed Mr. Bracken.

H. C. Beal

Stanley Bracken

J. A. Ingwersen, general manager of sales of The American Rolling Mill Co., has been elected vice president in charge of distribution, while **C. H. Murray** has become vice president in charge of personal and public relations, and **H. H. Tullis,** controller, a vice president. **Logan T. Johnston** has been appointed general manager of sales to succeed Mr. Ingwersen and **T. F. Olt** has become director of research, succeeding **Dr. Anson Hayes,** who is retiring.

Lyman W. Slack, vice president and general sales manager of the Packard Motor Car Co., has been elected a director.

R. W. Kerr, formerly vice president and treasurer of the Plomb Tool Co., Los Angeles, was made executive vice president recently.

Frank R. Simon, assistant to the president of The Carlyle Johnson Machine Co., Manchester, Conn., has been made general manager of the firm.

W. B. Livingston has joined the Ford Motor Co. to head its bus operations.

Giles C. Hoyt and **General Levin H. Campbell** have been elected executive vice presidents of International Harvester Co., while **William E. Worth,** formerly executive vice president, has retired. Other appointments made at the same time include **Robert P. Messenger,** vice president in charge of foreign operations; **Ralph C. Archer,** vice president in charge of the farm implement division; and **Michael J. Graham,** general manager of the farm tractor division.

E. W. Jackson, general parts manager at Caterpillar Tractor Co. since 1944, has been appointed director of parts and service, while **M. T. Deames** has become general parts manager and **W. Blackie** has assumed guidance of the traffic department. Also, **J. H. Deaderick,** vice president in charge of Parts, Service and Traffic departments, and **E. L. Murray** have resigned to join **Fred Elder** of Phoenix as Caterpillar distributor for Arizona.

Richard T. Nalle has been elected president of The Midvale Co., Philadelphia, succeeding **Francis Bradley,** who has been elected chairman of the board after 45 years with the company.

Herbert C. Guterman, senior vice president and general manager of Arma Corp. since last fall, has been named president of the firm succeeding **Arthur P. Davis,** one of the corporation's founders, who remains as director and engineering consultant.

H. C. Guterman

Don Loeber

Don Loeber has been appointed sales engineer in New Jersey and metropolitan New York for the Cosa Corp. He was formerly with the Eclipse Pioneer Div., Bendix Aviation Corp.

Homer Parsons has been appointed director of exports for the American Brake Shoe Co., New York City.

Henry G. Emt, former vice president, has been elected president and treasurer of the James Coulter Machine Co., Bridgeport, Conn., succeeding **James Coulter,** who has resigned after serving for many years as president. At the same time, **Edwin W. Thornton** was named to succeed Mr. Emt as vice president.

Charles H. Godschall, manager of the Metal Div. of Philco Corp. for the past eight years, has been named works manager of the new Philco refrigerator-freezer production facilities in Philadelphia.

Gilbert A. Bunn has been appointed manager of the Kennametal, Inc. Middle-Atlantic district with offices in Philadelphia.

William T. Gossett, vice president and general counsel of the Ford Motor Co., has been named a director.

R. M. Lindgren, former chief engineer of Lincoln Park Industries, and **Paul E. Dimling,** formerly with Firth-Sterling Steel Co., have joined Metal Carbides Corp., Youngstown, Ohio, as sales engineers with headquarters at 6432 Cass Ave., Detroit from which they will cover the Detroit industrial area and Michigan.

Clarence E. Hawke has been appointed director of domestic sales for the Carborundum Co., Niagara Falls, N. Y., while **Edwin B. Forse** has become manager of the Carborundum Refractories Div. and **Boyd H. Johnson,** manager of Refractories sales at Perth Amboy; and **Russell G. Albertson,** division manager of Canadian Carborundum Co., Ltd., Niagara Falls, Ont.

W. J. Campbell will, on July 1, become General Electric arc welding specialist for the southeastern district with headquarters in Atlanta. His territory will include N. C., S. C., Tenn., Ga., Fla., Ala., Miss. and part of La.

H. L. Pehrson is now manager of West Coast sales of Ladish Co. forged and seamless welding pipe fittings with offices at 714 W. Olympic Blvd., Los Angeles.

William B. Anderson has been appointed manager of the Aviation Gas Turbine Div. of the Westinghouse Electric Corp. He succeeds **George H. Woodward** as division manager.

Harold V. Schmidt has been appointed manager of the Western Electric Company's Buffalo shops.

Nicholas L. Phillips has been appointed manager of the Buffalo branch office, Crucible Steel Co.

Ralph Wilcox has been named manager of the Detroit division of Gerity-Michigan Die Castings Co. and **Walter C. Lok** is now manager of the Adrian Beecher St. plant.

BUSINESS ITEMS

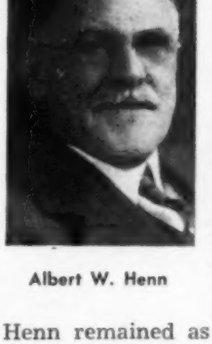
E. W. Buschman Co., Cincinnati, has purchased the Winton Place buildings and real estate of **The King Machine Tool Co.,** which will concentrate its operations at the new government plant at Tennessee and Paddock Rds.

The Jessop Steel Co., Washington, Pa., and the **Alan Wood Steel Co.,** Conshohocken, Pa. have completed an agreement whereby the technical and manufacturing facilities of both companies are to be used for large tonnage production of stainless-clad steel sheets.

Progressive Welder Co., Detroit, has opened a local sales and sales engineering office at 578 Maccabees Bldg. to better serve the Detroit Metropolitan area. The new office, known as the **Progressive Welder Sales Co.,** is headed by **Harry S. Rose,** former Progressive sales manager.

F. Rawdon Myers, formerly in charge of heat treating sales for the New Britain Machine Co., has joined with **Robert M. Booth** to establish a manufacturers' agency in Cincinnati. The firm will handle industrial equipment, including Cuno Engineering Corp. filters.

OBITUARIES



Albert W. Henn

Albert W. Henn, 82, one of the founders and for many years president of the National Acme Co., Cleveland, died May 15. Mr. Henn and his brother organized the company in Hartford, Conn. in 1896, but moved to Cleveland six years later. Mr. Henn remained as president of the company until 1925 when he retired, but continued as a director until his death.

Elmer R. Gilbert, 54, president of the Freeman Supply Co., Toledo, Ohio, passed away May 14.

Joseph S. Pecker, 52, former president of the Machine & Tool Designing Co., Philadelphia, died May 6. Mr. Pecker was active in the development of both the autogiro and the helicopter.

Clifford J. Luers, 57, died May 7. Mr. Luers was associated with the Mueller Machine Tool Co., Cincinnati, until 25 years ago when he and his brother started Luers, Inc., a machine tool business in Mt. Clemens, Mich.

Levi W. Moen, 63, retired head of the engineering department of Lamson Corp., Syracuse, N. Y., passed away May 8.

Albert J. Burgmeier, 51, executive secretary of City Tool & Engineering Co., Dayton, Ohio, died May 13. He had been associated with the engineering firm for 33 years.

J. Linn Johnson, 62, founder and former president of the Wilkes-Barre Welding and Machine Co., Wilkes-Barre, Pa., died May 4.

MEETINGS

American Management Association. General management meeting. Waldorf-Astoria Hotel, New York N. Y. June 11-12. Edward K. Moss, director of public relations, 330 W. 42 St., New York 18, N. Y.

American Society for Quality Control. Annual convention and Midwest Quality Control Conference. Hotel Sherman, Chicago, Ill. June 5-6. Edward D. Thompson, general chairman, P. O. Box 1097, Chicago 90, Ill.

American Society for Testing Materials. Annual meeting. Chalfonte-Haddon Hall, Atlantic City, N. J. June 16-20. R. J. Painter, 1916 Race St., Philadelphia 3, Pa.

American Society of Mechanical Engineers. Semi-annual meeting. Stevens Hotel, Chicago, Ill. June 15-19. Ernest Hartford, executive assistant secretary, 29 W. 39 St., New York 18, N. Y.

Machinery Dealers National Association. Convention. Netherlands Plaza Hotel, Cincinnati, Ohio. June 17-19. R. K. Vinson, executive director, 20 N. Wacker Dr., Chicago 6, Ill.

Society of Automotive Engineers. Summer meeting. French Lick Springs Hotel, French Lick, Ind. June 1-6. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

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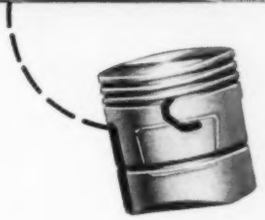

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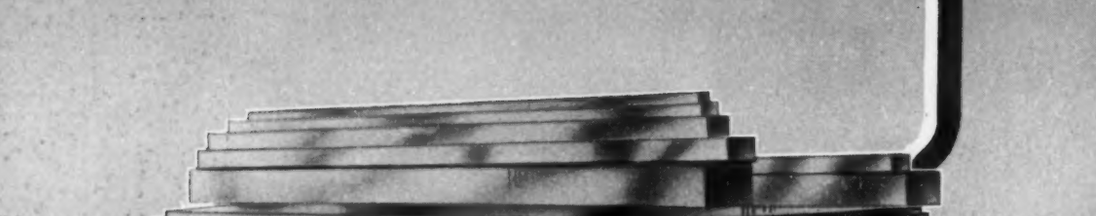

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Expansion Fits with Liquid Nitrogen

DATA COURTESY THE LINDE AIR PRODUCTS CO.

LIQUID nitrogen is now available in 5-, 15-, 25-, 50- and 100-liter insulated containers or 100-gal. 4-wheeled transfer tanks, from which it can be used economically. With special equipment to prevent splashing, it can be poured like water, although larger containers are emptied by pumping. In the latter case, pressure is built up by evaporating some of the liquid nitrogen which is bled into an external heat-transfer coil.

A variety of cooling equipment has been developed, ranging from an insulated bucket to machines similar to dispensing machines in which a part is injected to eject a cooled one, as in bottled-beverage dispensers.

High-purity liquid nitrogen avoids fire danger inherent in liquid air or oxygen, yet gives lower temperatures. It offers top possibilities for expansion fits when the external member is massive or likely to be damaged by heating an equivalent amount. Liquid nitrogen offers 390 F. differential from room temperature, which, if obtained by heating (though cheaper) brings temperatures of the external element to 460 F., close to tempering temperature.

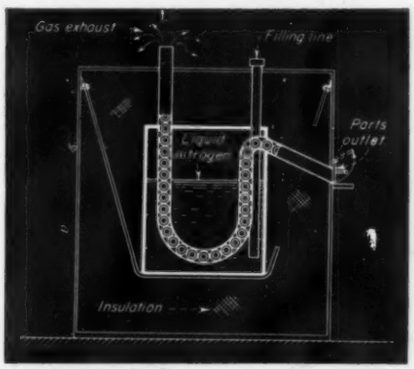
Physical Characteristics — Colorless, odorless, non-toxic, relatively inert. Forms 75.5% of air by weight, 78.06% by volume. As a liquid, resembles clear water. It boils at –320.4 F. (carbon dioxide –109.3 F.) and freezes at –345.75 F. at atmospheric pressure. Critical pressure 492.3 psi. abs.; liquid density 50.45 lb./cu. ft. (CO_2 = 98.8 lb./cu.ft. solid); vapor density 0.07238; ratio of expansion, liquid to vapor, 696. Latent heat, 85.6 Btu./lb. (CO_2 = 265.3); total heat (through 60 F.) 179.8 Btu./lb. (CO_2 = 330 Btu./lb.).

Equivalents—1 lb. liquid nitrogen gives 13.6 cu.ft. of vapor, 1 gal. gives 93.0 cu.ft., 1 liter gives 24.6 cu.ft., 1 gal. weighs 6.73 lb. and equals 3.78 179.8 Btu./lb. (CO_2 = 330 Btu./lb.).

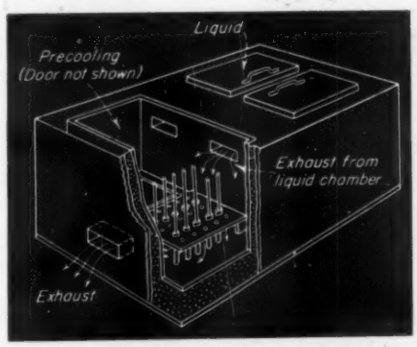
Typical Tolerances—1 in. dia. (nominal) steel shaft to enter a 1-in. bore: Total shrinkage (see table) 0.0022 in. Shaft dia. of 0.0018 plus 0.000 minus 0.0005, and bore dia. of 1.0000 plus 0.0005 minus 0.000 will give max. interference of 0.0018 in., min. interference of 0.0008 in.

2-in. dia. (nominal) shaft: Total shrinkage 0.0044 in. Shaft dia. of 2.0035 plus 0.000 minus 0.001, and bore dia. of 2.0000 plus 0.001 minus 0.000 will give max. interference of 0.0035 in. min. interference of 0.0015.

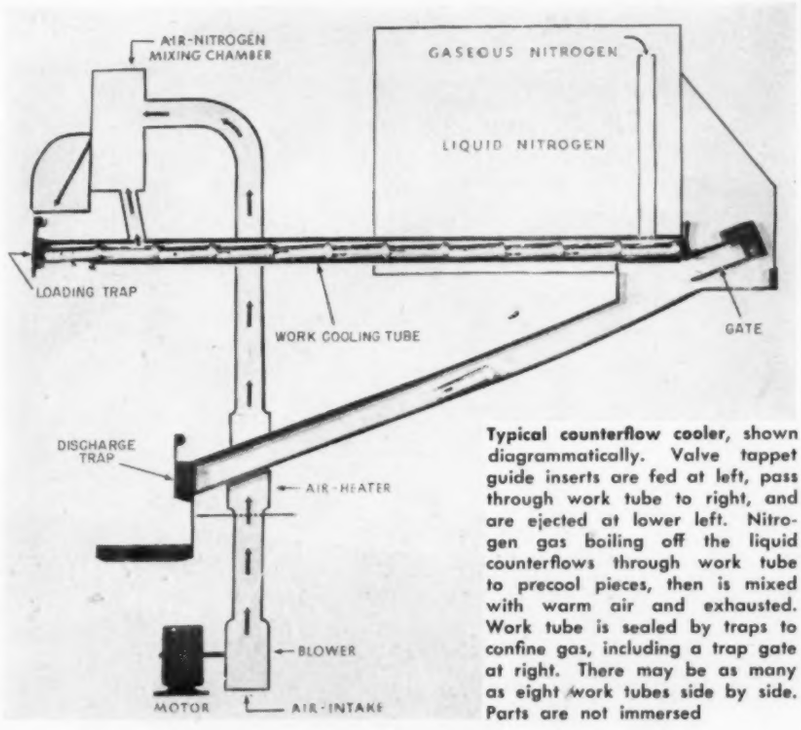
Illustrative Problems—Expansion-fit an aluminum ring 1.505 in. O.D. × 1 in. I.D. × 5/16 in. thick into a brass ring 1.500 in. I.D. × 2.25 in. O.D. × 5/16 in. thick. Aluminum rings weigh 0.1 lb. each, and have av. spe-



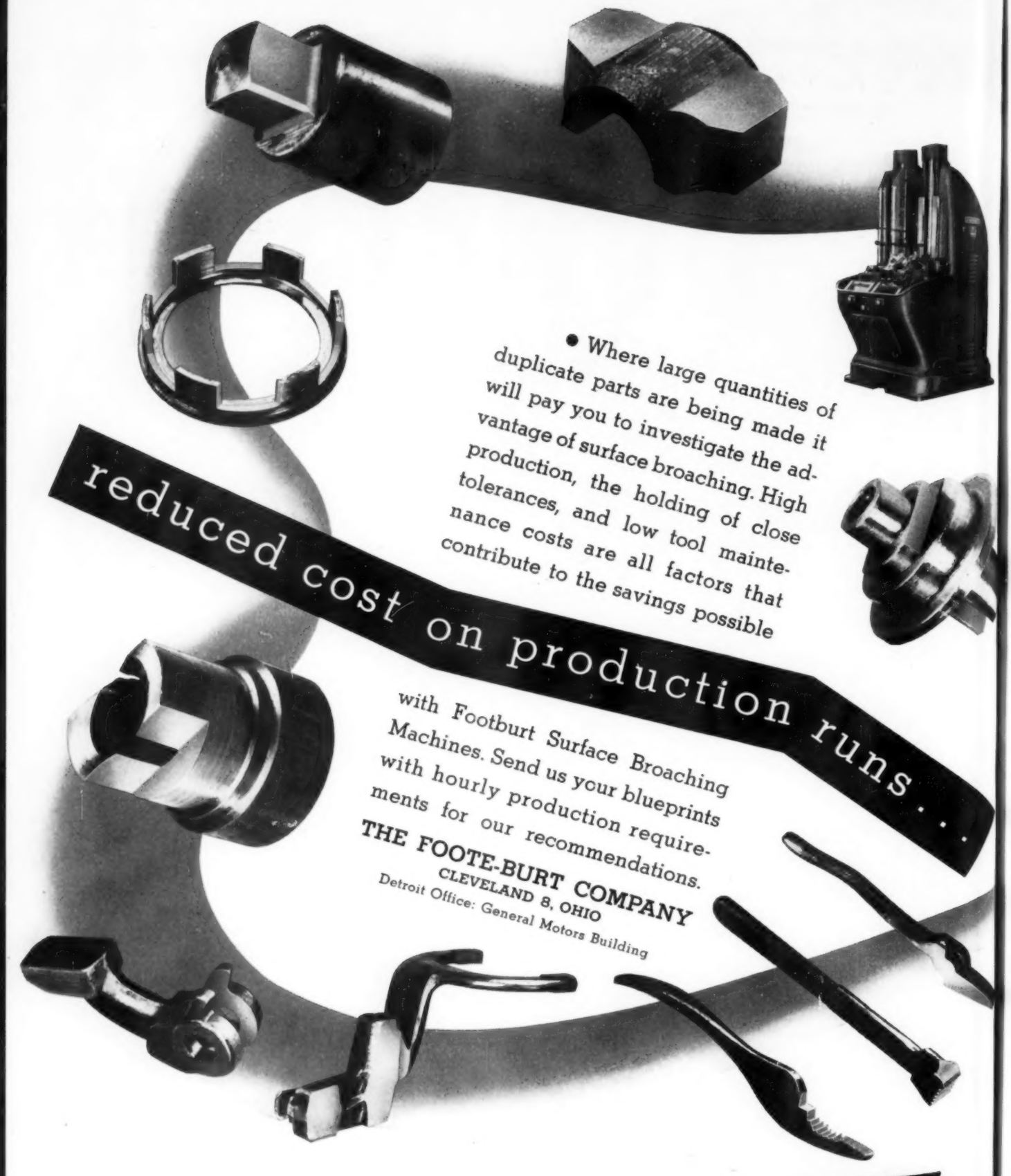
Typical immersion cooler, in this case for valve-seat inserts. Precooled by gas passing around them to exhaust at top, parts are fed down through the liquid, then rise to the ejection trap at right. Such units may have six work tubes side by side, plus a separate test-batch cooling chamber. A commercial model can handle parts 1⅛ to 2¼ in. dia. and 5/16 in. thick in twin tubes



Separate precooling is provided in this batch unit for longer pieces. Parts, in trays, are placed in the precooling chamber, through which exhaust gas flows, then transferred for immersion in liquid for final cooling



Typical counterflow cooler, shown diagrammatically. Valve tappet guide inserts are fed at left, pass through work tube to right, and are ejected at lower left. Nitrogen gas boiling off the liquid counterflows through work tube to precool pieces, then is mixed with warm air and exhausted. Work tube is sealed by traps to confine gas, including a trap gate at right. There may be as many as eight work tubes side by side. Parts are not immersed



• Where large quantities of duplicate parts are being made it will pay you to investigate the advantage of surface broaching. High production, the holding of close tolerances, and low tool maintenance costs are all factors that contribute to the savings possible

reduced cost on production runs . . .

with Footburt Surface Broaching Machines. Send us your blueprints with hourly production requirements for our recommendations.

THE FOOTE-BURT COMPANY
CLEVELAND 8, OHIO
Detroit Office: General Motors Building

FOOTBURT *Surface Broaching*

FOOTBURT PATENTED TOOTH FORM

cific heat of 0.20.

1. High-purity liquid to cool 100 Al. rings from + 75 F. to –320 F. (total temperature differential 395 F.)

For those who wish to make the calculations, the procedure is given below. It is normally easier, however, to utilize the consumption figure given in the table at right, which is based on experiments with these specific conditions, hence does not require the specific heat.

Heat content of 100 parts =
Sp. ht. × no. parts × wt. of parts × temp. change
= 0.20 × 100 × 0.1 × 395
= 780 Btu.

Liquid nitrogen used

$$= \frac{\text{Heat absorbed}}{\text{Latent heat of Nitrogen}}$$

$$= \frac{780}{85} = 9.16 \text{ lb.}$$

Conversion to gas = 9.16 lb. × 13.6 = 125 cu.ft. (see Equivalents)

Or from "Consumption" table:
100 parts × 0.1 × 12.5 = 125 cu.ft.

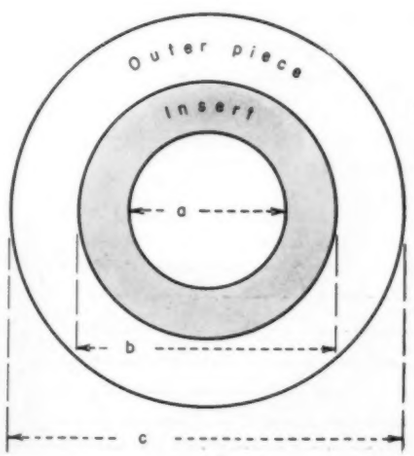
2. Force required to separate members

$$\text{Radial stress } (q) = \frac{d}{b}$$

(see sketch below)

$$\frac{1}{\frac{1}{E_o}\left(\frac{c^2+b^2}{c^2-b^2}+M_o\right)+\frac{1}{E_1}\left(\frac{b^2+a^2}{b^2-a^2}-M_1\right)}$$

Where
d = *diametral interference*
E_o, E_1 = *Young's Modulus for outer & inner members*
M_o, M_1 = *Poisson's ratio for outer & inner members.*
Other symbols are as sketched



EXPANSION FITS WITH LIQUID NITROGEN (cont.)

$$q = \frac{0.005}{1.5} \times \frac{1}{\frac{1}{15{,}000{,}000}\left(\frac{2.25^2+1.5^2}{2.25^2-1.5^2}\times 0.35\right)+\frac{1}{10{,}000{,}000}\left(\frac{1.5^2+1}{1.5^2-1}-0.33\right)}$$

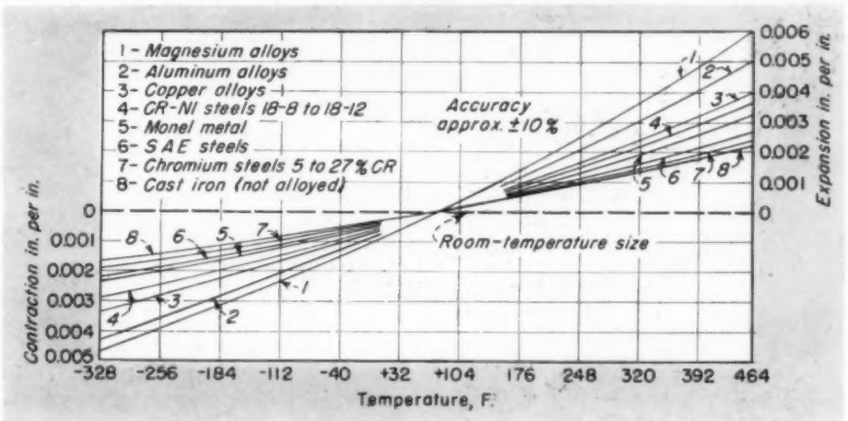
$$= 0.0033 \times 235{,}000{,}000 = 7850 \text{ lb./sq.in.}$$

Force required to separate is equal to the strength in tension (T), so:
T = *radial stress* × *contact area* × *coeff. of friction*
= 7850 × π × 1.5 × 5/16 × 0.6 = 6940 lb.

Strength in torsion (S):
S = *radial stress* × *contact area* × *coeff. of friction* × *radius*
= 7850 × 1.5 × 5/16 × 0.6 × 3/4 = 5220 in./lb.

Note: Young's Moduli, Poisson's ratios and coefficients of friction given in tables.

UNIT LINEAR VARIATION WITH TEMPERATURE



Consumption and Shrinkage

METAL	Consumption cu. ft./lb. Immersion in liquid	Consumption cu. ft./lb. Precool with gas, then immerse*	Metal Shrinkage (75F. to –321 F.) in./in. of dia.	Young's Modulus	Poisson's Ratio
Magnesium alloys	14.3	8.6	0.0046	6,000,000	0.28
Aluminum alloys	12.5	7.5	0.0042	10,000,000	0.33
Copper alloys	5.7	3.4	0.0033	15,000,000	0.35
Cr.-Ni. alloys (18-8 to 18-12)	6.0	3.6	0.0029	30,000,000	0.30
Monel metals	6.0	3.6	0.0023	26,000,000	0.32
SAE steels	6.0	3.6	0.0022	30,000,000	0.29
Cr. steels (5 to 27% Cr.)	6.0	3.6	0.0019	30,000,000	0.33
Cast iron (not alloyed)	7.0	4.2	0.0017	15,000,000	0.25

**Multiply values in first column by 0.60*

Coefficients of Friction

Note: Find one of the mating materials in the column below, the other in that at right. Their intersection in the table is the coefficient.	Mag. alloys	Al. alloys	Cu. alloys	Cr.-Ni. alloys	SAE alloys	Cr. steels (5-27%)	Cast iron (pure)
Magnesium alloys	0.8	0.8	0.6	0.5	0.5	0.5	0.2
Aluminum alloys		0.9	0.7	0.6	0.6	0.6	0.2
Copper alloys			0.6	0.5	0.5	0.5	0.3
Cr.-Ni. alloys (18-8 to 18-12)				0.4	0.4	0.4	0.2
SAE steels					0.4	0.4	0.2
Cr. steels (5 to 27% Cr.)						0.4	0.2
Cast iron (not alloyed)							0.3

Does this cold-swaged cable fitting give you an idea?

It took a lot of experimenting before engineers found the right combination of "physicals" for these rugged aircraft-cable terminals.

This answer came up: Special-analysis ARMCO Stainless Steel bars. Here the swaged cable fittings are shown attached to springs in the hydraulic landing gear mechanism of a DC-6 — two of the 50 or more cable ends in the new Mainliner 300 of United Air Lines. Many other planes are equipped with cable ends like these for controls operated from the cockpit.

The job calls for corrosion resistant stainless steel of great strength, good ductility, and high machinability. It must withstand the drilling of a hole through the length of the bar, and "take" the bear-hug of a cold-swaging operation without cracking.

ARMCO 18-8 FM, Type 303 bars filled the bill completely. Barrels of cable turnbuckles and sleeves are machined from ARMCO 17 FM hexagons, Type 430F.

Finding the right stainless steel here is another example of the way Armco engineers work with designers of equipment. If this sparks an idea for you, fill in and mail the coupon at the bottom of this page. Just address Rustless Division, The American Rolling Mill Company, 3412 E. Chase Street, Baltimore 13, Maryland.

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Division of ARMCO

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☐ I would like to talk with an Armco Engineer about these products: _____

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Company _____

Street _____

City _____ State _____

Sine Bars, Blocks, Plates and Fixtures

Commercial Standard CS 141-47, issued by the Division of Trade Standards, National Bureau of Standards. Effective as a voluntary standard of the trade from Aug. 15, 1947

DEFINITIONS

Sine bar. For purposes of this standard, a sine bar consists essentially of a bar serving as a straight-edge and two cylindrical buttons mounted thereon with their axes parallel and at a specified distance apart, and with the line of the button centers accurately parallel to the upper face (and lower face, if a reference surface) of the bar.

Sine block, sine plate. This consists essentially of a block or plate providing reference surfaces, with two cylinders attached to the block or plate and disposed to provide for measurement of angles in the same manner as with a sine bar. Facilities for attachment of accessories or work pieces to the several surfaces of the block or plate, or short extensions (heels) constituting the legs of a right angle iron or both, are customarily provided.

Sine-bar fixture. A sine-bar fixture consists essentially of a sine bar, a flat surfaced base, and means for adjusting and holding the sine bar in accurate relation to the surface of the base.

Sine-plate fixture. A sine-plate fixture consists essentially of a sine block or plate and a base with the reference areas of its upper and lower surfaces plane and parallel. The plate is usually hinged to the base at one end. Sine-plate fixtures may be of the compound type with provision for angular adjustment in two planes.

DETAIL REQUIREMENTS

Sine Bars

Types. Sine bars are manufactured in two types, side button and base button, corresponding to the positioning of the buttons on the side of the bar or on the under surface of the bar.

Construction. The buttons attached to the side or to the under surface of the bar shall be ground and lapped to the same size. The side faces of the bar shall be ground square with the working face or faces which may be ground, or ground and lapped, as specified by agreement.

Material. Sine bars shall be tool steel, hardened, drawn and seasoned.

Hardness. Buttons shall have a Rockwell hardness of C62-66 and the bar shall have a Rockwell hardness of C60-65 or equivalent surface hardness.

Accuracy. A sine bar shall conform in all respects to the accuracy requirements of its classification and size (See table). For sizes smaller than 5 in., tolerances for the 5-in. size of the designated class shall apply. For sizes above 5 in.—other than 10 in. and 20 in.—applicable tolerances shall be obtained by straight line interpolation between the values in the table or by extrapolation on the straight lines determined by the 10-in. and 20-in. values in the table.

Sine Blocks and Sine Plates

Construction. Cylinders shall be ground and lapped to the same size. The side faces of the block or plate shall be ground square with the working faces which may be ground or ground and lapped as specified.

Material. Sine blocks and sine plates shall be tool steel, hardened, drawn and seasoned.

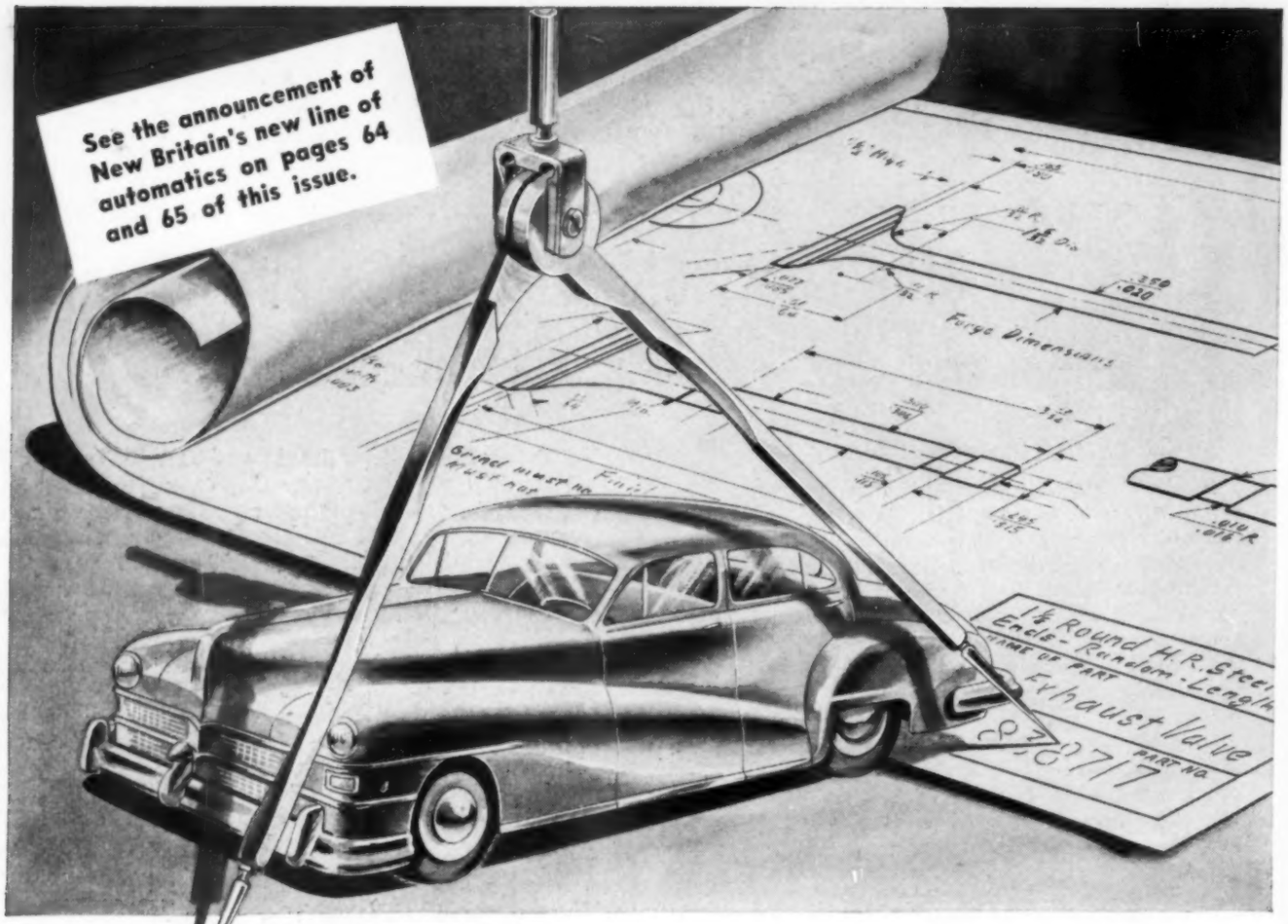
Accuracy. Accuracy requirements for sine blocks and sine plates shall be interpreted as in the case of sine bars.

Construction. This shall be such as to provide for smooth adjustment of the sine bar or sine plate, and if provided with clamping means said construction shall be rigid when the sine bar or sine plate is fastened in position.

Material—The bases of sine-bar and sine-plate fixtures shall be seasoned cast iron of 180-220 Brinell hardness; steel bases, Rockwell C60-65.

TOLERANCES FOR SINE BARS, BLOCKS AND PLATES

Commercial Class				
1	2	3	4	5
	Bar	Buttons or Cylinders		
Size	Working surface to be flat, square with sides and parallel (if double), within	Cylinders to be alike round and straight, within	Cylinders to be parallel with each other and with working surface of bar, within	Cylinders to be at nominal center distance, ±
in.	in.	in.	in.	in.
5	0.00010	0.00005	0.00010	0.0002
10	0.00015	0.00005	0.00015	0.0003
20	0.00020	0.00006	0.00020	0.0004
		(Laboratory Class)		
5	0.000050	0.00003	0.000050	0.00010
10	0.000075	0.00003	0.000075	0.00015
20	0.000100	0.00004	0.000100	0.00020


See the announcement of New Britain's new line of automatics on pages 64 and 65 of this issue.
Forge Dimensions
Exhaust Valve

ALL THE GOOD NEWS COMES FROM PRODUCTION EFFICIENCY

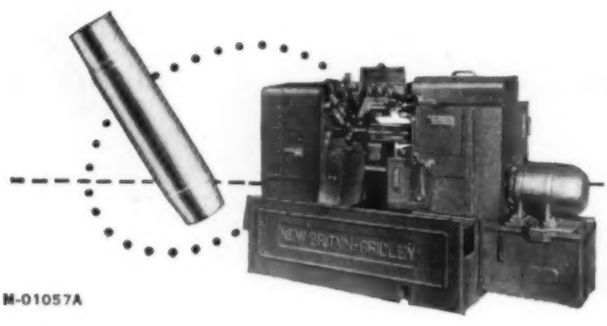
PAYING for higher wages and maintaining profits by raising prices is a sure formula for stagnation.

Lowering prices at the expense of wages or earnings on investors' savings produces the identical result.

Lower *costs*, resulting from *greater manufacturing efficiency*, is the answer. Here is something management and labor agree on wholeheartedly. But you don't *get* it by agreeing about it.

Engineers, by designing new automatic machines, new tools, and new set-up methods, have offered the key to solving the problem. It's up to management to make these better machines and methods available. It's up to the man at the machine to use that machine for all it's worth.

EXAMPLE: Formerly a leading automotive manufacturer found it necessary to rough grind the O.D. of this valve stem guide, machine the I.D. and then finish grind the O.D. Today the outside diameter is finish ground before being magazine fed into a Model 60 New Britain screw machine, which turns out over 406 pieces per hour with concentricity between inside and outside diameters well within the required .002 total indicator reading. Here is a sound saving, which, repeated in thousands of thousands of parts makes an important contribution to lowered costs.



M-01057A

New Britain Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Shop Equipment News

Warner & Swasey 16.-in. Electro-Cycle Turret Lathes Designed to Speed Machine Handling of Brass Parts

AUTOMATIC-DRUM CONTROL is incorporated in the new line of Electro-Cycle turret lathes developed by The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio. Mounted on the ram and mechanically actuated by either forward or backward indexing of the hexagon turret, it automatically controls the working sequence.

Although developed primarily for brass, the Electro-Cycle can be used for turning bronze, aluminum, plastics and other non-ferrous materials. Previously much time has been lost in changing speeds, starting, stopping or reversing the spindle, and in slow loading and unloading of the work.

Four drums in the automatic control each serve one necessary spindle function: start and stop, reverse for threading, high and low speed, right- and left-hand rotation. Six adjustable knobs for each drum (one for each turret face) permit rapid set-up for any desired working sequence.

A choice of three speed ranges is determined by the V-belt sheaves installed at the factory. Flexibility is provided in each range by a three-step sheave and two-speed motor. The double steel-cable belts are changed by hand from one step to another during set-up to give the high-low combination desired—high speed for turning and low speed for threading.

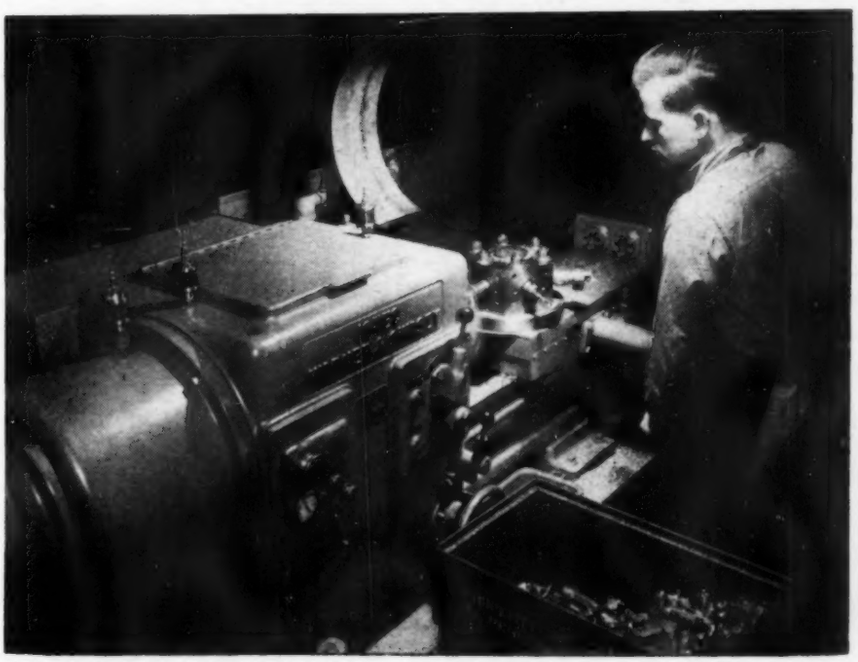
Air-chuck equipment is standard. As the final operation is completed current to the motor is cut off. The plugging switch decelerates the motor, and at a predetermined position the brake sets to stop the chuck in position for easiest unloading and loading.

When an operation requires automatic reverse, a limit switch is tripped by contact with a stop screw on the ram, with a movable dog mounted just ahead of the solid stop on the saddle. Adjustment of the stop screw is said to hold depth of succeeding operations to within one-eighth of a spindle revolution.

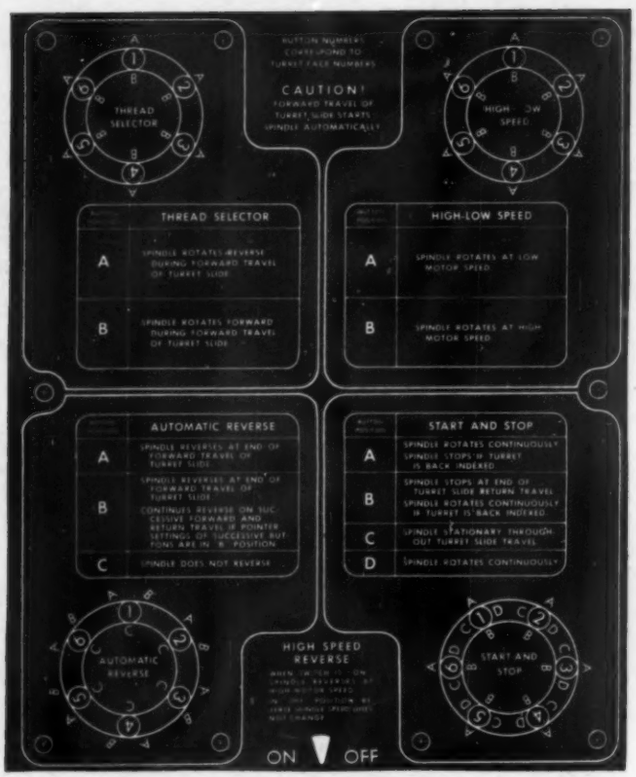
High-speed reverse is possible for backing off from threading or tapping operations. The lathe has a 1½-in. bar capacity and will swing 16⅞ in. over the bed.

Experimental models have been placed in operation in several brass-working shops. The Bastian-Blessing Co. has reported results for 15 jobs ranging from 1500 to 20,000 pieces on brass forgings weighing from 4

Desired working sequence is established by setting the automatic-drum control mounted on the ram (foreground) which has a knob for each of four machine functions for each of the six turret faces of the Electro-Cycle



Air distributor bodies are tapped, drilled and reamed on this Electro-Cycle. Even this simple sequence is speeded by the automatic control, air chuck, and positioner which stops spindle in loading position



Instruction plate for the drum control shows how four functions are set for each turret position. In addition to the four drums, a switch selects high- or low-speed reverse for backing off

SPRAY BOOTH—Stainless-steel booth for silver spraying objects before electroplating is equipped with water spray, air reducer, air-pressure gage, plate-glass baffle to protect operator, safety valve, and rotating jig for holding objects. Suction fan draws excess spray through duct behind jig. Made by Monomelt Co., Inc., 1611 N. E. Polk St., Minneapolis, Minn.

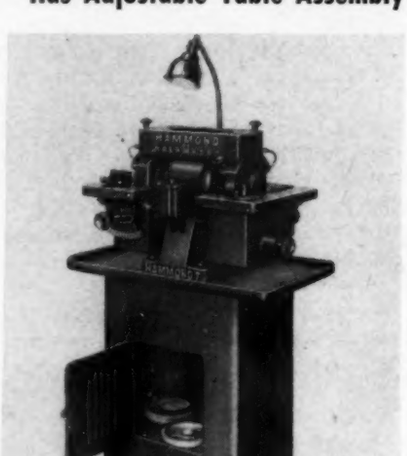
oz. to 1 lb. On the company's output of soda-fountain and torch-weld fittings, a 30% production increase is said to have been obtained.

Work at the National Cylinder Gas Company's Torch Weld Div., which was formerly done on Warner & Swasey No. 3 lathes, is reported 25% faster on the Electro-Cycle. The production superintendent attributes 10% of this to the air chuck, another 10% to the automatic change of spindle speeds, and the remaining 5% to automatic reverse for threading and automatic start and stop.

The R. Perlick Brass Co. reports that set-up time on the Electro-Cycle is 12 min. per tool as compared with a former average of 30 min.

Choice of lever-feed cross-slides, screw cross-slides, or a combination of the two is available, as well as horizontal forming slides. Feed and collet chuck boosters are available.

Hammond Carbide-Tool Grinder Has Adjustable Table Assembly



The Model 7 carbide-tool grinder is manufactured by Hammond Machinery Builders, Inc., Kalamazoo 54, Mich. Available in bench and floor models, the machine takes either 6- or 7-in. wheels, diamond cup or silicon-carbide cup.

Spindle and bearings are oversize, and a double-row bearing takes end thrust. Tables are 8x14 in. and set to any angle from 25° above to 35° below horizontal. Setting is accomplished by turning locking lever with one hand and tilting table with other hand. The table assembly adjusts "in and out" by screw feed. The motor is ½ hp., 3450 rpm. A fast-acting brake is provided.

Feedall Automatic Hopper Feed Attaches to Chute or Magazine

The Model H-1000 automatic hopper feed is announced by Feedall Machine & Engineering Co., 70 Vine St., Willoughby, Ohio. With a capacity for 1⅛-in. dia. to 6-in. long shoulder work or 1¼-in. dia. to 6-in. long cylindrical work, the feed can be attached to units such as centerless grinders, drilling machines, induction-heating machines and special machines. It can be attached to chute or magazine feed.

An oscillating pick-up blade passes through the bowl, picks up work in a slot, and deposits it in the chute. Blade movement is adjustable for different types of work, and blade speed is controlled by handwheel on the side of the machine. The machine is self-driven with variable-speed drive.

TIME SAVED 25%
PRODUCTION NEARLY DOUBLED
NO MAJOR OVERHAUL OR REPLACEMENT
Performance Speaks for itself...
BY FAR THE MOST ACCURATE LATHE
OUTPUT INCREASED 25%
EMINENTLY SATISFACTORY
250% INCREASE IN PRODUCTION OF TRANSMISSION SHAFTS

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On the letterheads of the nation's best-known plants . . . from every industry . . . come enthusiastic comments on the performance of their Lodge & Shipley Lathes. Whether tool room or engine lathe, manufacturing or Duomatic lathe, hollow spindle, gap lathe, or turret lathes . . . these fine tools rate highest approval from owners.*

For more than half a century, Lodge & Shipley Lathes have maintained a world-wide reputation for quality performance and dependability unequalled by any other lathe. Whether your shop is large or small, it will pay you to investigate the advantages of these modern, perfect-turning tools. Lodge & Shipley Engineers are as near as your phone. Write for Condensed Catalog, showing the complete line.

*Names gladly furnished.

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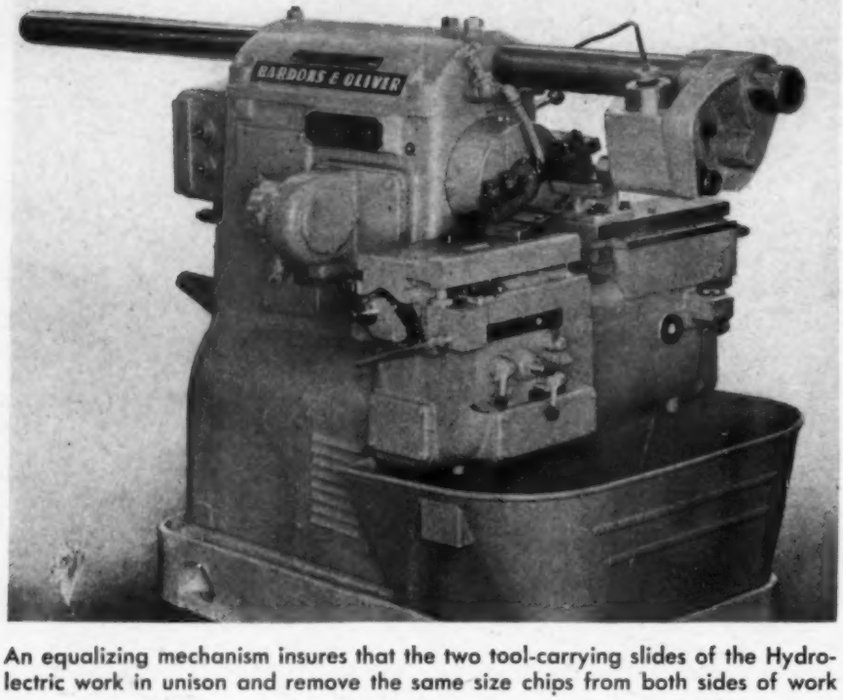
Bardons & Oliver Automatic Lathe Performs Chamfer and Cut-Off Work



An equalizing mechanism insures that the two tool-carrying slides of the Hydrolectric work in unison and remove the same size chips from both sides of work

The Hydrolectric automatic lathe is announced by Bardons & Oliver, Inc., 1133 W. 9th St., Cleveland 13, Ohio. Designed to chamfer and cut off parts made from pipe, tubing or solid bar stock, the machine is made in two sizes: No. 33 which takes 3-in. tubing through the collet-chuck plunger, and No. 34 which takes 4-in. tubing.

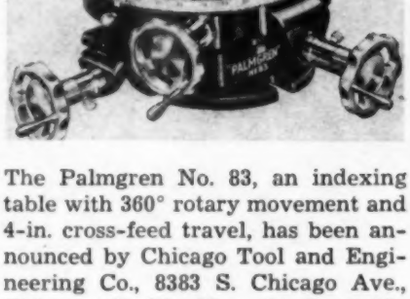
The unit operates either as a full-cycle automatic or single-cycle manually controlled machine. When automatic, it gives 30 or more cycles per min. with one or more pieces per cycle. When single cycle, it crops or trims tube ends and performs similar operations.

A geared pump, built in as an integral part of the spindle-drive transmission, delivers oil for the in-and-out rapid traverse slide movements and also for the hydraulic control circuit. The control circuit is operated by adjustable dogs on the front slide. An adjustable-volume pump meters out oil for the feed stroke. It is driven by the spindle and mounted on the front of the column.

Stock is gripped by a hinge-type collet hydraulically opened and closed and synchronized with the front slide. The collet-operating cylinder is also supplied by the geared pump. A roller feed at the rear of the spindle moves stock through spindle and collet chuck against a solenoid-operated receding stock stop. Solenoids are timed with the opening and closing of the collet chuck and are operated by a dog on the front slide.

An electric motor in the base of the column furnishes the power for the machine. There are four spindle-speed changes by means of sliding-gear clusters, and pick-off gears provide 72 spindle speeds from 85 to 1100 rpm.

Palmgren No. 83 Indexing Table Gives 4-in. Cross-Feed Travel



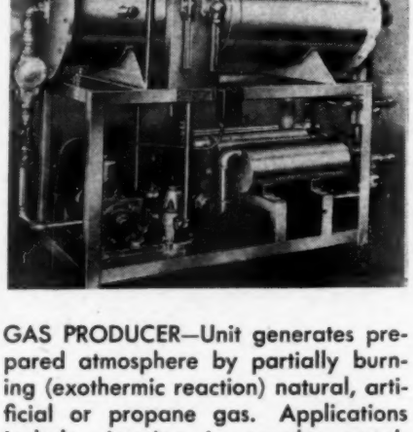
The Palmgren No. 83, an indexing table with 360° rotary movement and 4-in. cross-feed travel, has been announced by Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill. The circular table has 8-in. dia. with ⅝ x 1⅛-in. T-slot, and it is graduated in single degrees. A graduated adjustment screw permits accurate setting.

The cross-feed movement provides 2-in. travel each way from center. It is controlled by graduated screw. The table may be mounted on the table of a milling machine, drill-press, shaper or surface grinder.

A. K. Allen Dial-Feed Table Indexed By Compressed Air

An air-operated dial-feed table is announced by The A. K. Allen Co., 3011 Ft. Hamilton Pkwy., Brooklyn 18, N. Y. Compressed air passes through a 3-way valve, moving a piston to operate the pawl arm. The pawl indexes the table and locks it in indexed position until the valve is released, allowing a spring to return the pawl for next indexing.

Designed to be applied to machines such as punch presses, drillpresses and millers, the unit has a 12-position 7¼-in. dia. table. Air pressure from 30 to 50 psi. is used.



GAS PRODUCER—Unit generates prepared atmosphere by partially burning (exothermic reaction) natural, artificial or propane gas. Applications include sintering in powder metallurgy, and bright or clear annealing. Built in sizes from 350 to 60,000 cu. ft. per hr. by Bellevue Industrial Furnace Co., 2971 Bellevue, Detroit 7, Mich.

STEP-SHAFTS AIR-TRACED

for greater economy

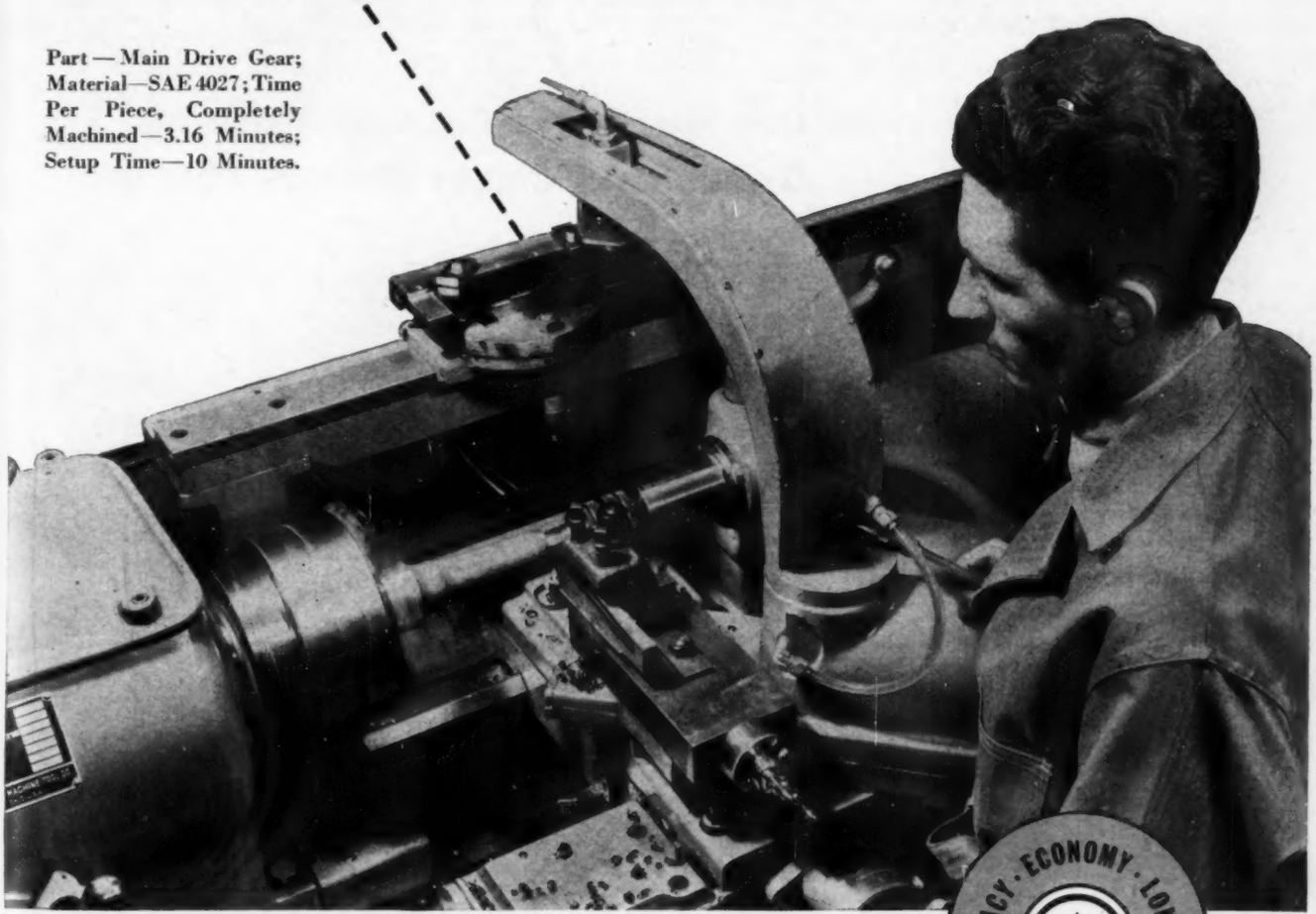
Turning step-shafts? Here's how to save—on setup time, on resharpening time, on machining costs—*and on original machine investment.*

The gear blank shown is a typical example. Turned on a multiple-tool automatic, the setup requires anywhere from 2 to 3½ hours. When AIR-TRACED, although machining time is the same, setup is *only ten minutes or less.* There's only one lathe tool to sharpen—and the machine is easily adaptable to a wide range of work—boring or turning—contours, tapers, step-shafts. Accuracy is greater, too, because operation is stepless, continuous—and *automatic.* There's less chance for human errors. Result? Fewer rejects, lower machining costs.

May we show you how the Monarch Air-Tracer can give you accurate, economical high production on *your* class of work? Ask for bulletin 2601.

THE MONARCH MACHINE TOOL COMPANY
Sidney, Ohio

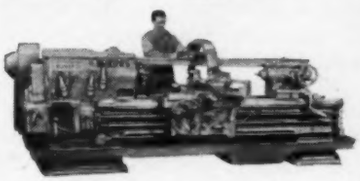
Part—Main Drive Gear; Material—SAE 4027; Time Per Piece, Completely Machined—3.16 Minutes; Setup Time—10 Minutes.



FOR SPEED, ACCURACY AND FINISH, THE MONARCH AIR-TRACER*

1. Stepless cutting-tool motion provides a superior continuous finish.
2. Setup times averaging five to ten minutes permit profitable use for a wide variety of small-lot production jobs.
3. Automatic yet versatile operation results in economical, accurate high production.

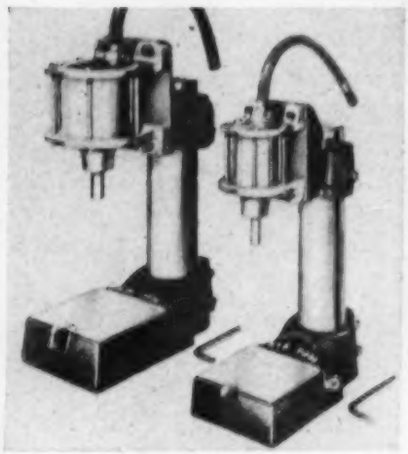
**Available exclusively on the new Monarch Lathes.*



ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

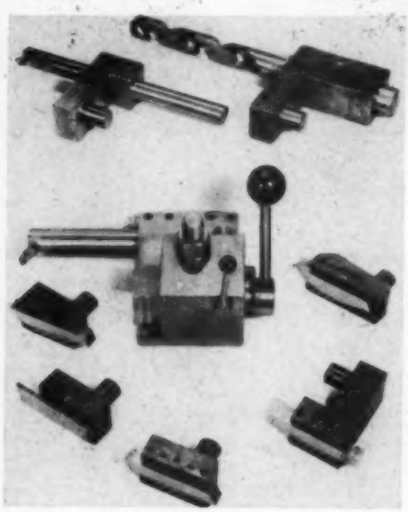
Air-Trol Air Arbor Presses Deliver ¾-, ¼-ton Squeeze



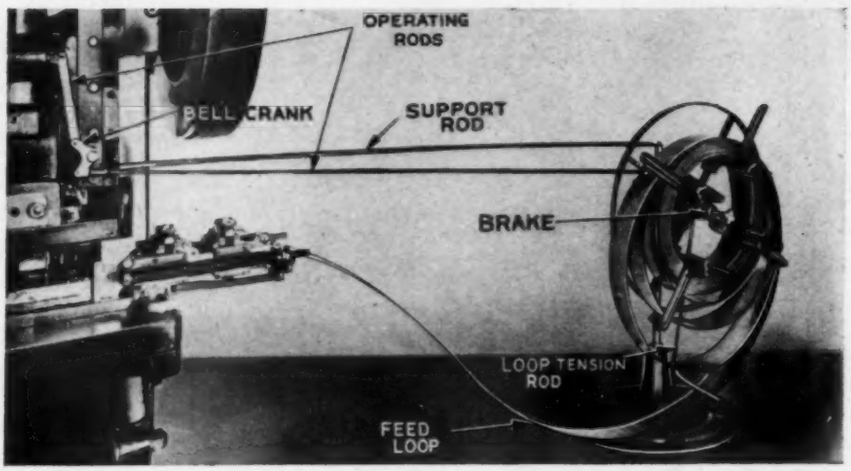
Two air arbor presses have been developed by Air-Trol, 2653 W. Lake St., Chicago 12, Ill. The presses combine the features of both arbor- and kick-type equipment.

The 72-lb. heavy-duty model delivers over ¾-ton squeeze at 150-lb. line pressure. The 40-lb. smaller model delivers approximately ¼ ton at the same pressure. Squeeze can be regulated by varying line pressure.

When equipped with foot-valve control, either model delivers full stroke with less than 1-in. foot movement. Cylinder brackets are adjustable to give 0- to 6-in. working range over the table.

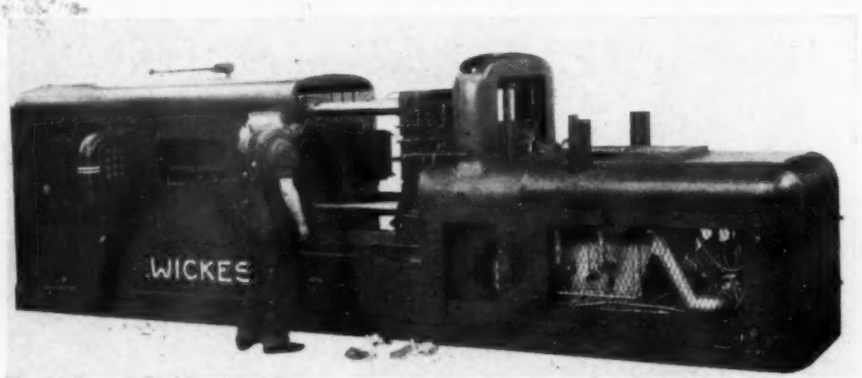


TOOLHOLDER — Fry Multi-Duty toolholder for operations including drilling, reaming, tapping, boring, turning, facing, threading, knurling and cutting-off in one chucking. Fits to compound of most engine lathes. Made by Airo Products Co., 2709 W. 54th St., Los Angeles 43, Calif.



STOCK REEL—Automatic unit powered by punch press through bell crank and tie rod. Spring-loaded feeding pawl engages rack gear on reel hub. Pawl cocks on up-stroke of press, causes reel to rotate on down stroke. Brake prevents over-running of reel, while amount of unreeling is governed by loop-tension rod which causes pawl-lifter to lift pawl free of rack gear or to engage rack gear and rotate reel. Made by H. E. Dickerman Mfg. Co., 321 Albany St., Springfield, Mass.

Wickes No. 4 Die-Casting Machine Opens and Closes Dies at 750 ipm.



Injection pressure of the No. 4 is supplied by heavy-duty accumulator which supplies quick hammer-blow pressure to twin injection cylinders

The number 4 automatic die-casting machine is announced by Wickes Brothers, Saginaw, Mich. With cycle initiated by electric pushbutton, the unit casts zinc, tin and lead and has up to 100 cu. in. injection capacity. Any single part of the cycle can be operated manually.

Dies open and close at 750 ipm. with a momentary slow-down just before closing. The opening of the dies can be adjusted from 6 to 16 in. by positioning a cam in the trip mechanism. Knockout timing and momentary slow-down are also adjustable. Injection pressure is from 1500 to 6000 psi.

Distance between platen and bolster plates is adjustable from 9 to 23 in. by a single-lever die-adjustment mechanism, hand or power operated. The platen is positioned by the die-opening adjustment lever. Maximum daylight opening between bolster and platen is 39 in.

Casting knockout is automatic and hydraulic, but can be manual if desired. Die-locking pressure is approximately 500 ton. Dual melting pots, one for pre-heat and the other for injection, make possible temperature control within 4 F. The machine is controlled by automatic electric timers, and all moving parts are automatically lubricated. Six infra-red burners supply heat.

GEAR HIGHLIGHTS

VOL. XI NO. 3

This is page 1 of the current issue. Write for the complete issue today.

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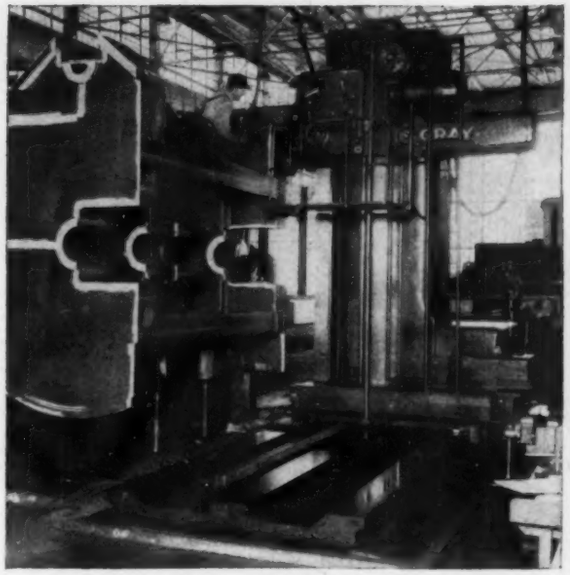
How to Design Better Gears in 10 Minutes .....p. 4

NEW GRAY Boring, Drilling and Milling Machine FEATURES Self-locking CONE-DRIVE



The column and head assembly on this big Gray Horizontal weighs approximately 46,000 pounds, a big mass of accuracy that must be microjogged as little as 0.00025 inches at one time for accurate positioning of the tools. The column may be fed along the runway at speeds ranging from ½ to 120 inches per minute.

To accomplish all this in the Gray Horizontal Boring, Drilling and Milling Machine, Gray engineers selected a set of 7.500" center distance Cone-Drive gears with a ratio of 40:1, to drive the pinion which meshes with the rack to propel and position the column along the runway. This particular set of Cone-Drives is self-locking,

(Continued on Page 3)

GEAR CHECKING RECORDERS AVAILABLE FROM STOCK

The versatile Michigan SINE-LINE gear checking recorder which makes a permanent chart record on gear checking machines is now available from stock.

The AY-1 Recorder may be used with Michigan SINE-LINE involute checkers, lead checkers, or the tooth spacing checkers. It may also be applied to a variety of additional checking operations such as recording variations in dimensions of thread forms, surface checking with parallels, and to many other checking operations wherein a precise record of dimensions is desired.

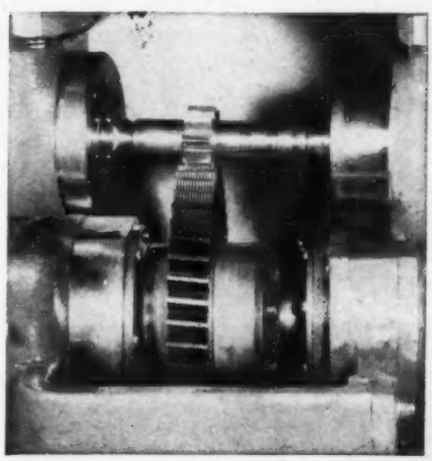
▼

COORDINATE TOOL DESIGN FOR MAXIMUM GEAR QUALITY

That best gear cutting results are obtained when pre-shave hobs and shaving cutters for any particular job are designed and engineered together is demonstrated again by the recent experience of one large producer of aircraft oil pump gears.

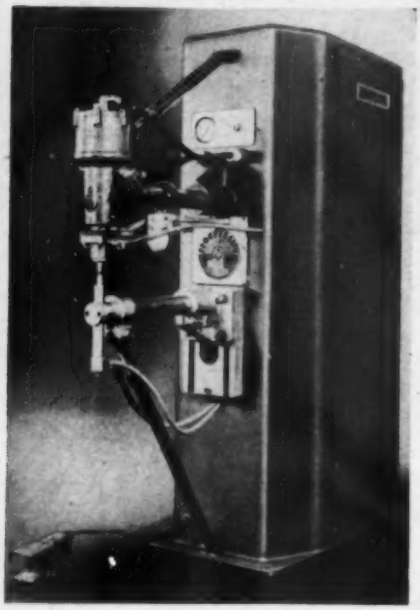
The operation involved the mass production of aircraft oil pump gears having a 7.1579 pitch and a

(Continued on Page 3)



MICHIGAN TOOL COMPANY 7171 East McNichols Road DETROIT 12, - - U.S.A.

Progressive Spot-Welding Units Have Low-Inertia Welding Heads



An improved line of 30-, 50- and 75-kva. pedestal-type spot-welding machines is announced by Progressive Welder Co., 3050 E. Outer Dr., Detroit 12, Mich. The heavy structure has been concentrated at the front of the machines, permitting light sheet-metal construction for the rear.

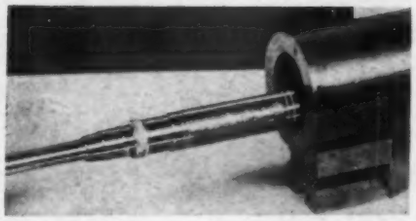
Sheet-metal panels and full-length door on left side provide access to all units contained in the machine. The right side is clear for side-mounting of electronic or other controls.

The units are designed for both job-welding runs and high-output rates. Knees are quick adjustable for miscellaneous jobs. Stroke is 2½ in., and different types of interchangeable electrode holders are available. The 12½-in. throat opening permits jobs that generally require swivel-arm construction.

The low-inertia welding head permits fast action. Visible water circulation is provided through three separate systems, one for each electrode and one for transformer. Air filter and air-system lubrication are standard equipment.

Physicists Research LA Tracer Measures Surface in Deep Bores

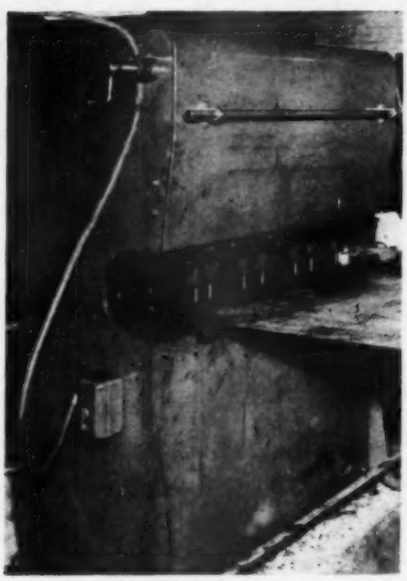
The Type LA tracer to be used with any type Profilometer for taking microinch surface-roughness measurement in deep bores is announced by Physicists Research Co., 321 S. Main St., Ann Arbor, Mich. The



tracer will measure to any desired depths in bores as small as ¾ in. I.D. It has a diamond tracing point which is self adjusting to the work surface. It measures bores such as hydraulic cylinders, camshafts and tubing.

Mechanically operated by means of a Mototrace and Type BA Linkarm, the tracer can take measurements to 36-in. or greater, depending on Linkarm used.

Lynn Hydraulic Press Brake Includes Self-Adjusting Ram

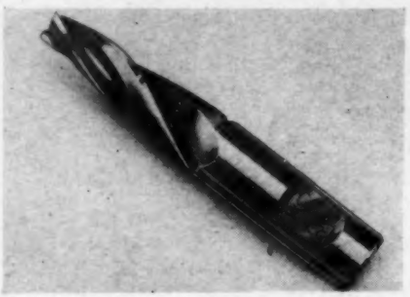


A hydraulic steel press brake has been developed by Lynn Mfg. Co., 1121 S. 7th St., Minneapolis 4, Minn. With a 4-in. stroke, the unit can give any stroke to 2¾ in. by means of a stroke-adjustment pin. Other adjustments are made by use of screw-stops on the sides of the brake. No adjustment of lower bed is necessary. The brake is portable.

Length between housings is 52½ in., and length of bed and ram is 55¾ in. Bending capacity in mild steel is 56 in. for No. 14 gage over ⅝-in. V die, 48-in. for No. 12 gage over 1-in. die, and 36-in. for No. 10 gage over 1⅛-in. die. The ram is self adjusting for depth, making it possible to break a 14-gage piece and a 20-gage piece on the same setup.

The hydraulic foot control enables the operator to bring the ram down at any desired speed, permitting 15 to 50 strokes per min. Provision is made to apply only maximum tonnage required to bend the metal, thus avoiding breakage if the die is improperly positioned. In the illustration the unit is being used for a punching operation.

Tapered Spiral Cadillac Cutters Machine Dies, Molds, Patterns

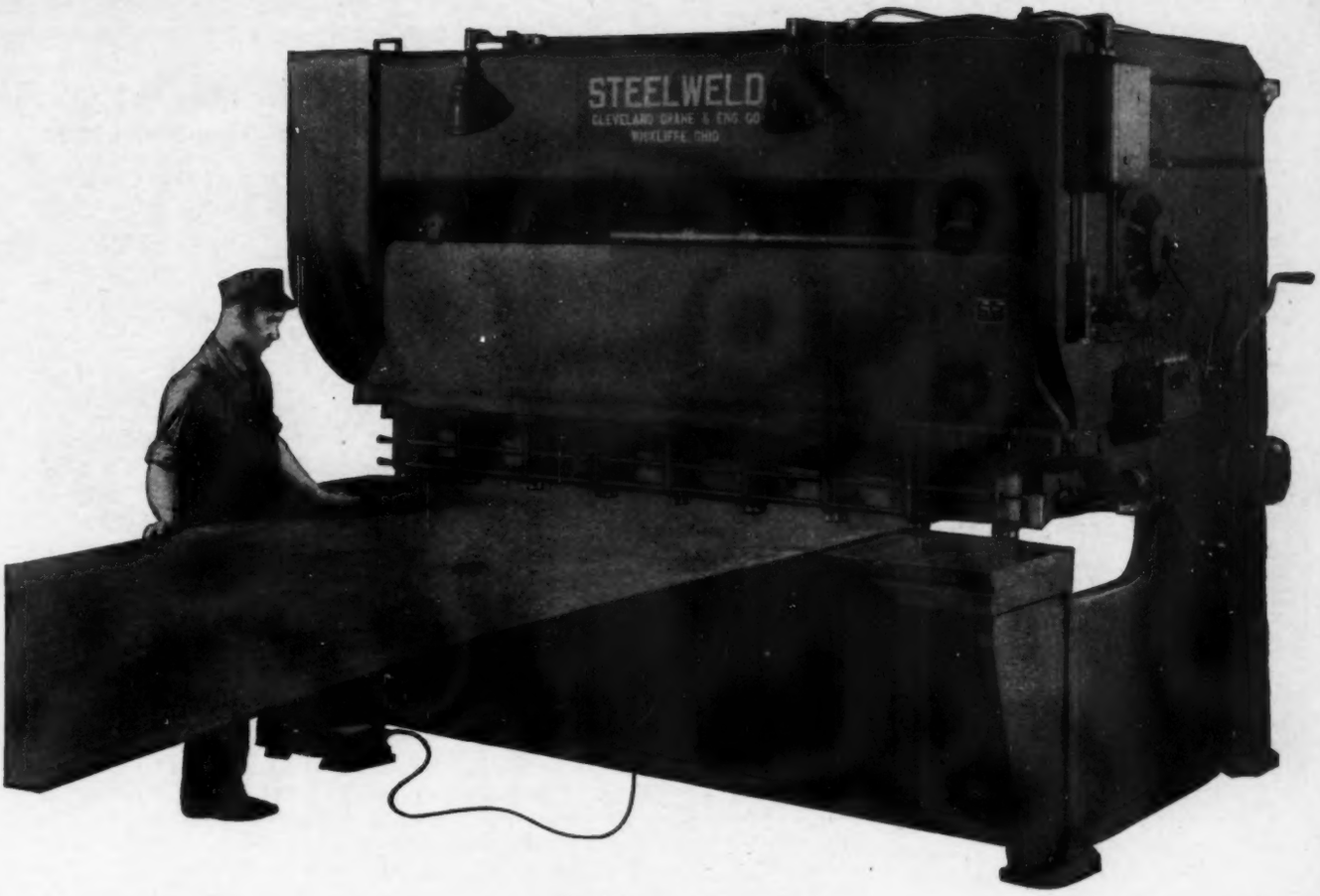


A line of high-speed-steel tapered-spiral cutters is being produced as standard items by Cadillac Cutter Co., 1613 Eastern Ave., S.E., Grand Rapids 7, Mich. Heretofore classified as special tools, the line ranges from ½ to 7° taper per side, ½- to 3½-in. flutes, and small-end dia. from 3/32 to ½ in.

Suited to machining applications such as dies, molds or other jobs where draft or clearance is required, the tools have a straight shank with flats for insertion in setscrew holders. They are designed with uniform hook rake, right-hand cut and spiral, and three flutes. Inside of the three flutes is ground, and radius or ball ends can be furnished when specified.

Rotor Tool Vertical Air Grinder Drives 6-in. Wheel to 5500 rpm.

The B-30 vertical air grinder is made by The Rotor Tool Co., 17325 Euclid Ave., Cleveland, Ohio. The tool drives 6-in. cup wheels at 3500



ALL STEELWELD SHEARS
CONTROLLED ELECTRICALLY...

OPERATION of Steelweld Shears is unusually easy and convenient. There is no tiresome lifting of the leg to work a foot treadle. Slow, fatiguing knee action has been replaced by fast easy toe action.

A safety type electric foot switch is used. It can be slid around the floor wherever most convenient. It enables shearing speeds not attainable with foot treadles for certain cutting operations.

For instance, when cutting narrow strips from a long sheet, the operator can push the sheet at the end and control the shear at the same time. He need not be near the machine. As the sheet becomes shorter he can move the switch along with his foot to always be within easy reach.

There is no extra charge for electrical foot control on Steelweld Shears — it is standard equipment on all size machines.

Steelweld Shears are radically different from all other shears with many outstanding features. Get the facts on these truly new and modern machines. Learn about the advantages they offer you.

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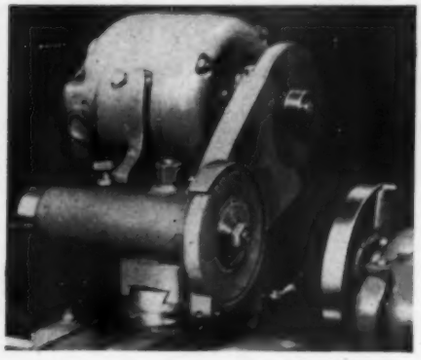
THE CLEVELAND CRANE & ENGINEERING CO.
1403 EAST 282nd ST. *WICKLIFFE, OHIO*

STEELWELD PIVOTED BLADE SHEARS

to 5500 rpm. for vertical grinding. For sanding with 9-in. pads, speeds are 4500 to 5000 rpm. For wire brushing with 6-in. cup brushes, speed is 3500 rpm.

The M-801 governor (see *AM*, Jan. 2, 1947, p. 132) is employed. Weight of the grinder is 12½ lb., height is 8½ in. A new muffler reduces noise without power loss.

South Bend Grinding Attachment Adapts to Various Machine Tools



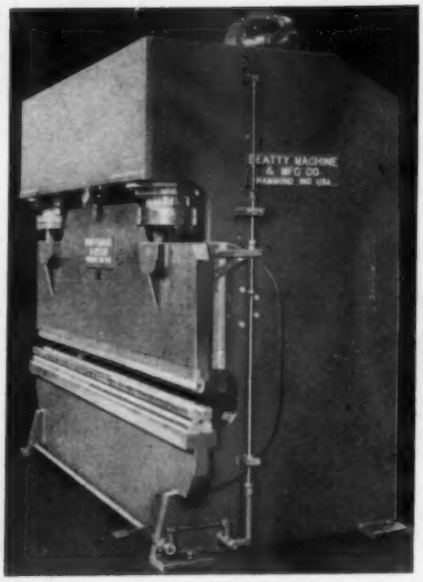
An electric grinding attachment for use on lathes and other machine tools is announced by South Bend Lathe Works, 378 E. Madison St., South Bend 22, Ind. Driven by a ¼-hp. constant-speed motor which permits heavier cuts than a universal-type motor of same rating, the attachment has a 4x½-in. grinding wheel. It is designed primarily for precision external grinding.

Tension adjustment is provided for the V-belt connecting the motor with grinding-wheel spindle. Various grades of wheels are available, and special cup wheels are supplied for reamer and cutter grinding. The attachment has frame sizes for various South Bend lathes, but can be adapted to other units.

Beatty Hydraulic Press Brake Operates in Any Part of Stroke

The Model No. 300 hydraulic press brake is announced by Beatty Machine & Mfg. Co., 940 150th St., Hammond, Ind. Designed to provide maximum flexibility, the unit has 300-ton capacity. It is also made in capacities from 200 to 600 tons with distance between housings ranging from 8½ to 12½ ft.

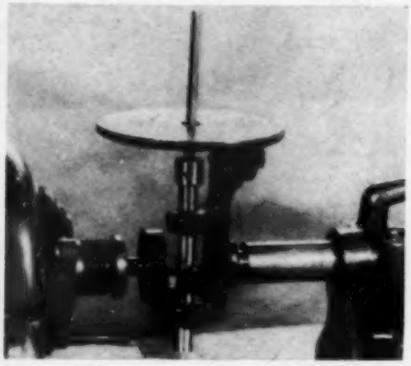
The machine can be adapted to operations such as V-bending, flanging, pressing and straightening. It can handle different plate thicknesses without minute ram adjustment. The ram advances at 310 ipm.



and returns at 285 ipm. Pressing under full load is at 14 ipm. The speeds can be varied from 0 to maximum.

An equalizer brings the ram down parallel with the bed by means of rack and an idler pinion shaft. Stroke-control features permit operation in any portion of the stroke between top and bottom limits.

Carey-Anslinger Filing Unit For Bench-, Floor-Model Lathe



A filing attachment for lathes is available from Carey-Anslinger Mfg. Co., 1129 E. Bourbonnais St., Kankakee, Ill. The 6-lb. attachment is desiged for any bench- or floor-model lathe and is fitted with Morse tapered arbors to fit the tailstock.

The driving mechanism is chucked in the headstock with collet or chuck, and it will drive at any lathe speed, giving ⅞-in. stroke. It will run in any position, take ¼-in. round-shank machine files, and has an adjustable tilting table.

LATHE—TRB S-56 lathe, added to the S-56 series made by Sheldon Machine Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill., incorporates "Zero Precision" Timken tapered roller bearings. The headstock is redesigned to accommodate large zero-inspection bearings, eliminating bearing caps and changing to larger solid housing. Lathe has 11¼-in. swing, 1-in. collet capacity. Bed is 56 in. long, has 35 in. between centers. 4-speed V-belt drive is housed in cabinet

When dies are allergic to heat

Symptoms

1. Poor machinability before heat-treatment.
2. Cracking of corners and thin sections.
3. Formation of surface scale.
4. Distortion and dimensional change.
5. Low abrasion-resistance.

Prescription

B A-H (BETHLEHEM AIR-HARDENING)

Results

- ✓ Good machinability.
- ✓ Hardens in air from 1550 F. (Rockwell C of 61-62 after tempering.)
- ✓ Keeps a clean surface.
- ✓ Minimum distortion and dimensional change.
- ✓ High abrasion-resistance.

Bethlehem Air-Hardening is indeed an aristocrat of die steels. It has proved the answer to many a perplexing die problem. Give it a trial on the next tough job and you'll appreciate its fine characteristics for high-production work.

TYPICAL ANALYSIS	C	Mn	Cr	Mo
	1.00	2.00	1.90	1.00

The nearest Bethlehem district office or distributor will gladly discuss your tool and die problems.

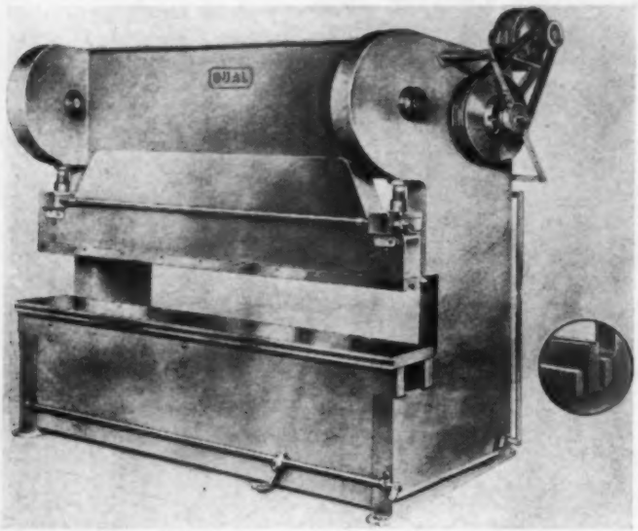
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

★ BETHLEHEM STEEL ★

B A-H... one of Bethlehem's fine tool steels

Dual "25" All Steel Press Brake For Forming, Blanking, Punching



The bolster of this press brake has 1/2×3/4-in. slot to receive standard brake dies when in vertical position for bending and brake work. In horizontal position it may be used for multiple punching, notching and other operations

The Series 25 press brake has been added to the line of Dual Press Co., St. Louis 18, Mo. With a capacity for 14-gage and lighter materials, it has all-steel completely welded construction. It is suited for forming, blanking and punching and is made in two models, 25-5 and 25-6.

The 25-5 model has a forming capacity in mild steel of 12 gage, 4 ft. Distance between housings is 50 in., length of bed and ram is 60 in., over-all length is 68 in., and the drive motor furnished is 1 hp.

The 25-6 model has a capacity of 14 gage, 6 ft. Distance between housings is 62 in., bed and ram length is 72 in., over-all length is 84 in. and drive motor is 2 hp.

Both units give 35 strokes per min., with a standard 2-in. stroke. Ram adjustment is 2½ in. Depth front to back is 42 in. and die space without bolster is 8½ in., with bolster vertical is 6 in. and is 7 in. with bolster horizontal.

Tumico Tubular Micrometers Cut Structural Weight to 50%

Micrometers with tubular structure to cut weight and provide easier movement with lighter "feel" are made by Tubular Micrometer Co., St. James, Minn. Said to have cut structural weight up to 50%, the micrometers have a wear take-up spindle bushing assembly which compensates for wear at the frame. Instead of one point of take-up for micrometer thread wear, the micrometers have three points: on the spindle, at the tip and on the thread.

Conventional micrometers range from 0 to 24 in. Blade types for measuring narrow depths run from 0 to 4½ in., and roller-mill micrometers have a 3- or 6-in. throat depth. Bow-type micrometers with interchangeable mandrels have 0- to 96-in. sizes. Inside micrometers can measure bores or openings from 6 to 106 in. An over-the-bar-type ranges from 8 to 28 in.

Peterson Surface-Grinding Unit Handles Flat-Surface Castings

A surface grinder designed to grind flat-surface castings to within 0.001-in. accuracy without setup is announced by Peterson Welding Laboratories, 1423 Virginia, Kansas City 6, Mo. Grinding is accomplished by guiding castings across the wheel.

The grinding stone is mounted level, as is the table top. A spider wheel permits the operator to use both hands for work and use his feet to raise the stone 2-in. maximum to grinding level. A 16-in. suction fan is bolted to the under side of the wheel to pull grinding dust down and deposit it in two collectors.

The grinder is in two models; 1A, with 14-in. stone and 3-hp. motor; 2A, with 16-in. stone, 5-hp. motor.

Metron Electromagnetic Gage Has Four Magnification Ranges

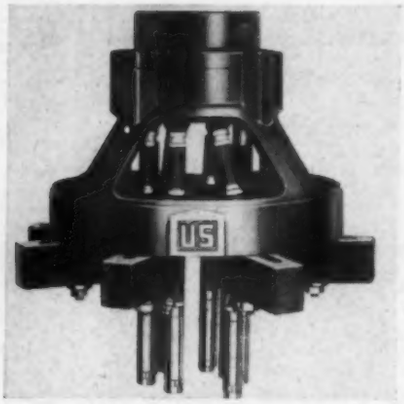
An electromagnetic comparator gage which does not use vacuum tubes or limited-life components is announced by Metron Instrument Co., 436 Lincoln St., Denver 9, Colo. With four ranges of magnification selected by means of switches, the gage is suitable for applications such as checking gage blocks and production inspecting of machined parts. Spindle pressure is adjustable from 4 oz. to 2½ lb.

Available in three models, the gage is calibrated in English or metric units. Model 10 ranges from one millionth to 0.0004 in., Model 20 from 10 millionths to 0.005 in., Model 30 from 0.00005 to 0.020 in.

The size accuracy, surface finish and improved physical properties of Cold Finished flats make them applicable for many uses without extensive machining. They are economically made into slides for machine tools, parts for jigs and fixtures and molds for rubber and plastic. J&L Cold Finished flats are available in a variety of grades—in sizes from 6" to 15" from your nearest J&L Warehouse or distributor.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA



U. S. Drill Head 8-Spindle Unit Adjusts within 6-in. Dia. Circle

A multiple adjustable-spindle drill-head is announced by U. S. Drill Head Co., 1960 Riverside Dr., Cincinnati 4, Ohio. An adaption of a flexible-joint adjustable spindle, it has eight spindles which can be adjusted to a minimum distance between spindles of 11/16 in. anywhere in the area of a 6-in. dia. circle. Minimum bolt circle with three and four spindles is 1 in. in dia. Maximum drill for each spindle is ¼ in. The head can be mounted on any sensitive drilling machine and weighs 21 lb. complete.

Photron Surface Comparator Reads from 0.5 Microinch

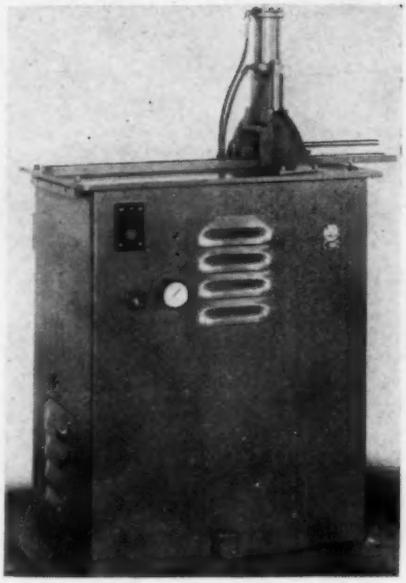
A 15-lb. self-contained Pico surface comparator is available from Photron Instrument Co., 5713 Euclid Ave., Cleveland 3, Ohio. With a range said to be from 0.5 microinch up, the unit consists of meter and exploring head. it is 11x9x7 in. high, has 20-w. power consumption, and operates on 110-v. 60-cycle line.

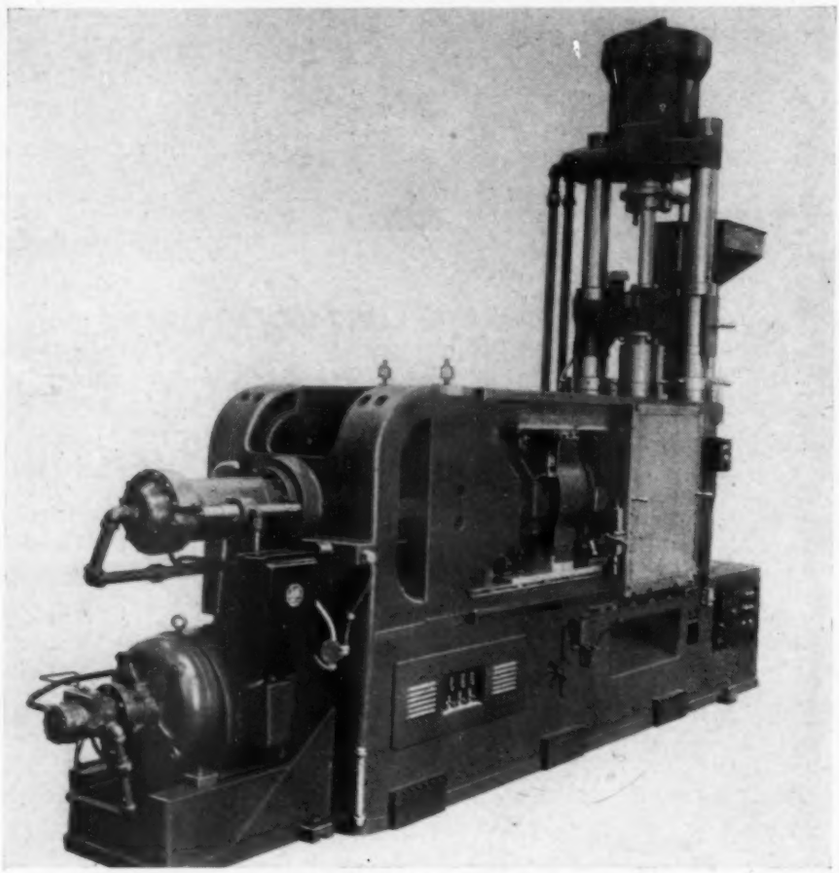
The head consists of light source, lens system and light-sensitive cell. The head is placed on the surface to be checked, the button is pushed, and the meter reading is compared with previously prepared standards. A reading is said to take about 5 sec.

Bullard Hydraulic Cut-Off Unit Employs Enclosed Abrasive Wheel

A hydraulic cut-off machine designed to handle material from hardest steel to softest non-ferrous metal is made by George H. Bullard Co., Inc., Westboro, Mass. Recommended for use with 14x3/32x1-in. resinoid-bonded wheels, the unit has fully enclosed abrasive wheel. The 3,500-rpm. spindle gives 13,500-sfpm. speed to the wheel.

A pushbutton operates both ½- and 5-hp. motors on the unit. After material is inserted in V-trough, a pedal is pressed to start the cycle. Hydraulic clamps lower and hold the work with pressure which can be varied from 157 to 282 lb. by a hand valve. Both sides of the material are held with equal pressure. After clamping is completed, the wheel starts upward and is forced into the material by a hydraulic cylinder which can be adjusted to give correct pressure without burning the work. Pressure remains constant after it is set, while rate of travel varies. After the cut is completed, the pedal is released and the wheel drops back into the case. The unit is said to finish stock within 0.003 in. of square.

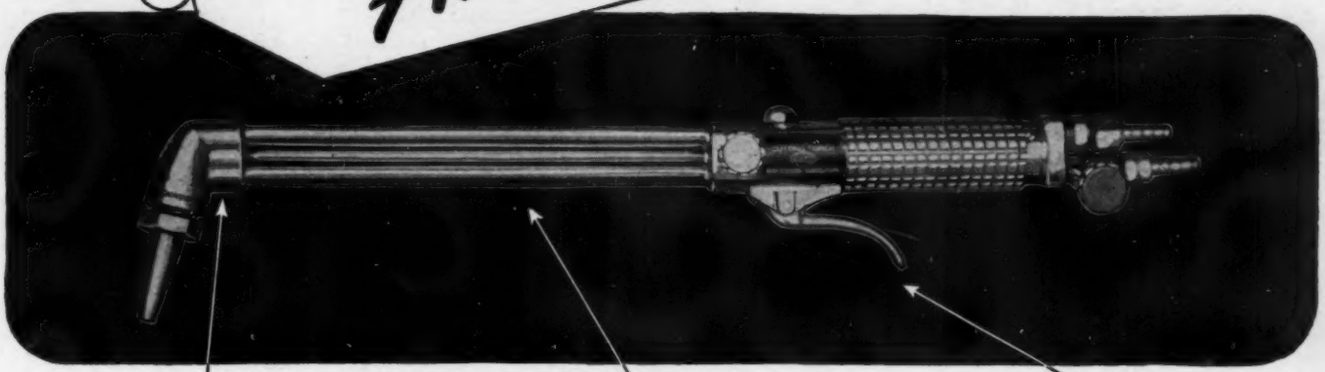




MOLDING MACHINE—Plastics injection machine can mold 32-oz. pieces over 150 sq. in. projected area. Made by Lester-Phoenix, Inc., 2711 Church, Cleveland, Ohio, machine incorporates all features of standard line on larger scale. Injection pressure is 27,000 psi, with 600-ton mold-locking pressure. Platens are 29½x40 in., maximum space between is 30 in. Injection cylinder is vertical, and injection speed and pressure are separately controlled

Again Available

. . . The Airco Series 9000 Cutting Torch with Monel Metal Head and Stainless Steel Tubes

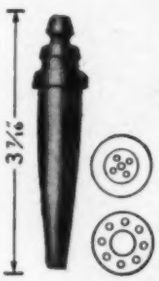


MONEL METAL HEAD for long trouble-free service; furnished with straight, 75°, or 90° angle heads in various torch lengths.

STAINLESS STEEL TUBES have greater rigidity and heat resistance — all connections are silver brazed to assure, permanent, leakproof service.

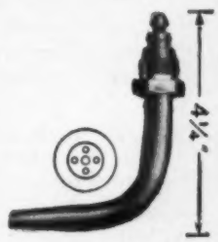
STAINLESS STEEL LEVER in a natural position for effortless operation.

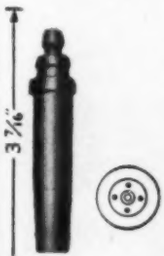
. . . and in addition to these outstanding, long-wearing features, this torch has **GREAT** versatility. It can be used for all conceivable types of cutting operations by means of many interchangeable types of cutting tips — a few of which are shown here:



STYLE 144 — For General Hand and Machine Cutting

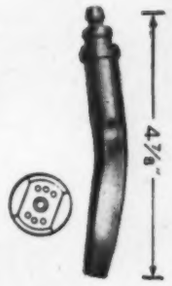
STYLE 181 — For Riser Cutting





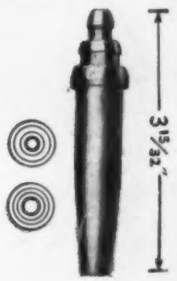
STYLE 197 — For Rivet Washing

STYLE 183 — Gouging, Removing Imperfect Welds, Grooving and Flame Machining



STYLE 195 — For Hand Cutting of Rivet Heads and Machine Cutting 45° Bevels

STYLE 209 — For General Hand and Machine Cutting with Oxygen and Propane or with Oxygen and Natural Gas



FOR COMPLETE INFORMATION ABOUT THIS VERSATILE TORCH, WITH ITS FULL COMPLEMENT OF TIPS, WRITE FOR BULLETINS ADC-617 AND ADG-1098. Address: Air Reduction, General Offices, 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, General Offices, Houston 1, Texas. Represented Internationally by Airco Export Corp.

AIRCO **AIR REDUCTION**

Offices in All Principal Cities

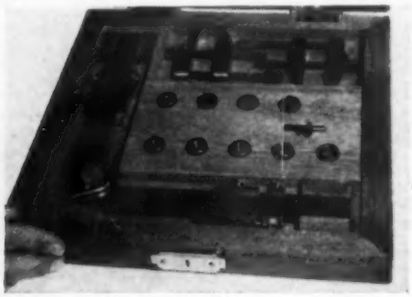
HEADQUARTERS FOR OXYGEN, ACETYLENE AND OTHER GASES...CARBIDE...GAS WELDING AND CUTTING APPARATUS AND SUPPLIES...ARC WELDERS, ELECTRODES AND ACCESSORIES

Bench Filer and Hole Locator Are Announced by DoAll Co.

Tools on this filing machine are actuated by a scotch-yoke mechanism running in an oil bath

A larger bench filing machine, Model FH-10, is made by The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. For filing, sawing and honing operations, the machine incorporates a universal-joint clamp said to assure vertical file position despite warped or twisted file shanks. The clamp is used on the smaller FH-1 model. A file-setting square is supplied to align file, hone or saw.

Powered by a ¼-hp. 110-v. 1724-rpm. ac. motor and giving approximately 350 strokes per min., the machine has 1½-in. stroke and ⅛- to ⅝-in. file-shank capacity. An overarm backup roller gives tool support, and the tilting table is 10⅝ in. square. A neoprene bellows keeps chips out of mechanism and provides intermittent air jet to point of work for chip removal. Files, saw and honing stone are included.



Holes can be located and drilled on an ordinary drillpress by use of this hole locator. It also checks dies and jigs

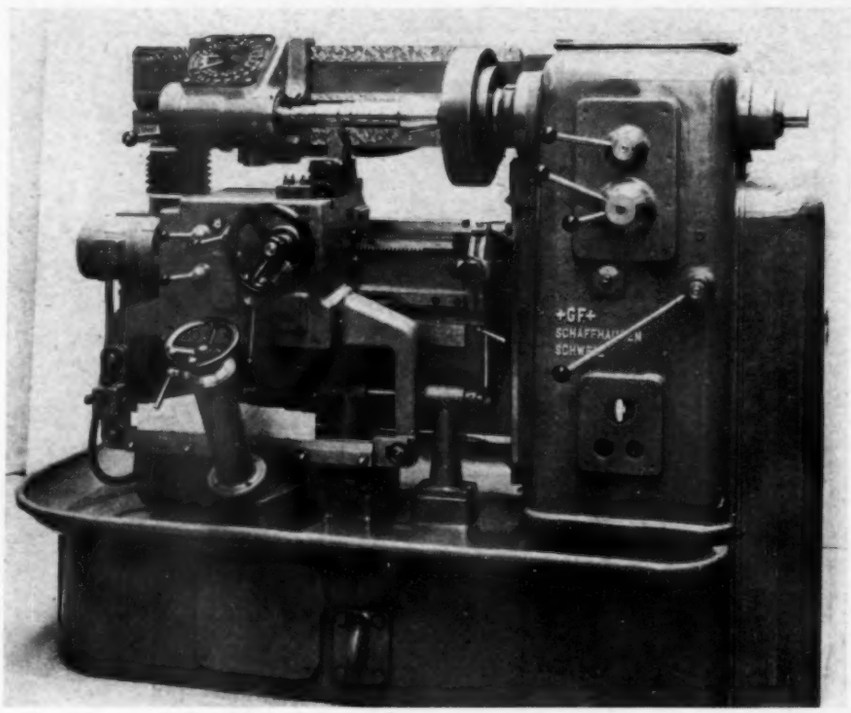
Also announced is a hole locator designed to permit drilling of jigs, dies and precision parts without using a jig borer. The locator consists of two tool-steel arms at right angles to each other. At the vertex of the angle, a ground tapered hole holds drill bushings by means of a bridge clamp. A vernier stop slides on each arm and can be set to less than 0.001 in. Each arm is graduated for 6 in.

To locate a center, two sides of the workpiece are used as reference sides. Slides are set to required dimensions, the locator is laid on the workpiece with the slides acting as stops against the reference sides, and the center of the tapered hole is at the desired location. The locator is then clamped to the work. After inserting a ¼-in. bushing, a center punch can be used.

Herman Stone Bench Plate

A solid, all-granite bench plate, 12x18-in., has been added to the line of The Herman Stone Co., 324 Harries Bldg., Dayton 2, Ohio. Said to be accurate to 0.00005 in., it is straight-sided and non-abrasive.

George Fischer Hydro-Copying Lathe Suited to Tungsten-Carbide Tooling

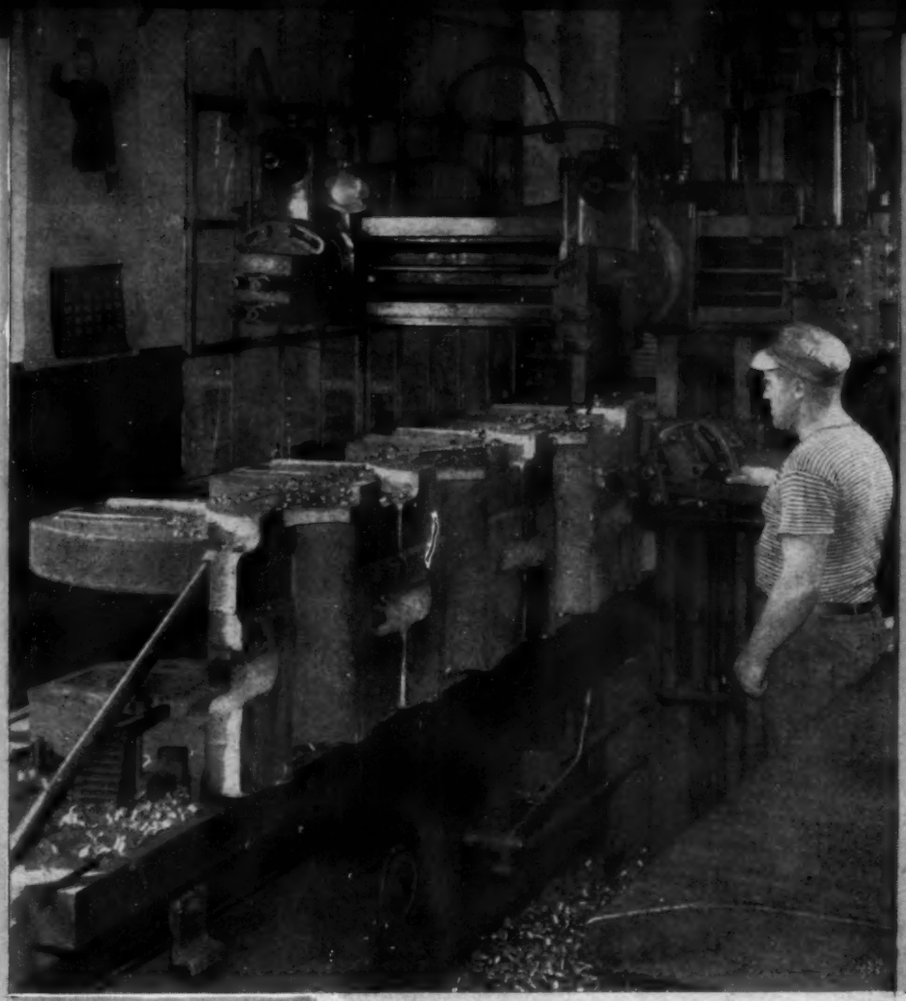


The tool is brought into contact from a point directly below the work. Cutting edge is to the rear, causing chips to flow away from operator

The Hydro-Copying Rigid lathe, made by George Fischer Steel and Iron Works, Ltd., Schaffhausen, Switzerland, is distributed by Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Designed especially to meet requirements of tungsten-carbide tooling, it is designed to fill the gap between the engine and turret lathes.

The head and tailstock are joined and braced by a massive overhead yoke. Cutting edge of the tool is to the rear, causing chips to flow away from the operator. The tool is ground to a negative rake and is made from 1½-in. square stock. Chatter is said to be eliminated even when taking ¼-in. cuts at 300-fpm. feed.

The lathe operates on the reproducing principle and has a hydraulic copying system. The work, which is held between centers at each end, is driven by self-centering claws. Simple templets made to the same scale as workpieces are used, and, by means of several accessory tools which are available, internal copying can be done. Rigid construction of the machine is said to permit maximum cutting speed.



Simplified Control

Quick Set-up

Fast Operation

Stepless Speeds

Smooth Cutting

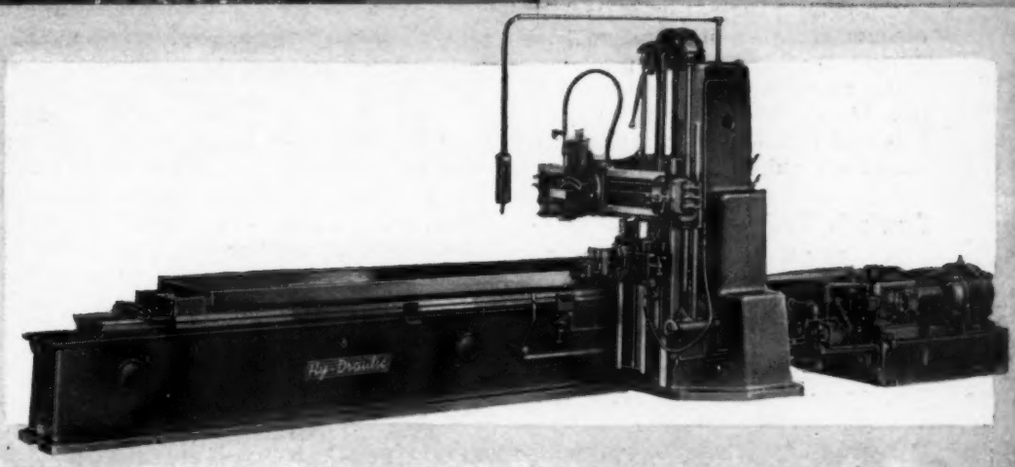
Fast Reversals

Long Tool Life

Because It's HY-DRAULIC

Rockford Hy-Draulic Shaper-Planers

Built in five standard sizes with table stroke lengths ranging from 42" to 144", Shaper-Planers are equipped to your specifications with single or double cross rail head . . . and with side rail head.



4616

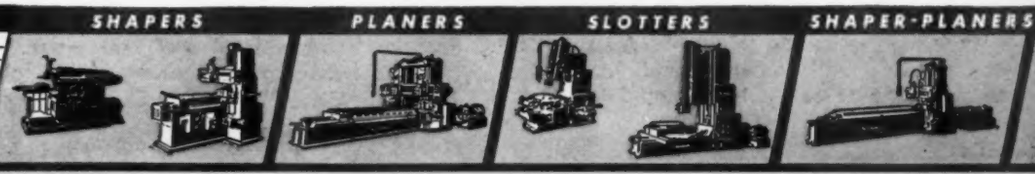
FASTER WORK on the "in-between" jobs . . . . . .

Because it's Hy-Draulic, the Rockford Shaper-Planer will give you faster work, on every type of shaper-planer job. The steel castings being machined above represent a typical application . . . work that is too small for standard planers, yet too large for shapers.

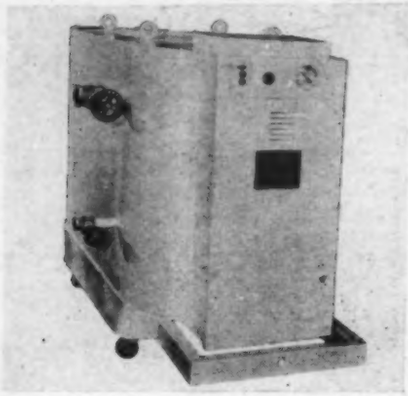
The reasons are many why Rockford Hy-Draulic Shaper-Planers hold "floor-to-floor" time to a minimum. Controls are centralized and responsive, speeding up both set-up and actual machining time. Cutting strokes may be quickly set for *any* length and speed required within capacity limits . . . reversals are fast. To help decrease your overall machining costs, we suggest you get the facts on Rockford Hy-Draulic Shaper-Planers. Ask for Bulletin 445.

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

Hy-Draulic



Castaloy Vacu-Therm Generator Gives Controlled Heat to 550 F.

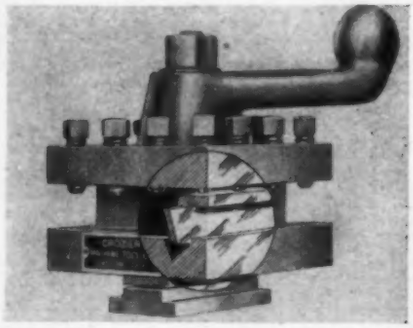


The Vacu-Therm generator, a mobile heating unit for plastics, is announced by Castaloy Corp., 197 S. Waterman, Detroit 17, Mich. The unit is designed to deliver controlled heat to 550 F. (plus or minus 5°) under low operating pressures. It is self-contained and has no moving parts.

Dowtherm E, a liquid which vaporizes when it reaches operating temperature, is used as a heat-transfer medium. Sealed in a welded vacuum chamber, it transfers heat through flexible tubes or pipes.

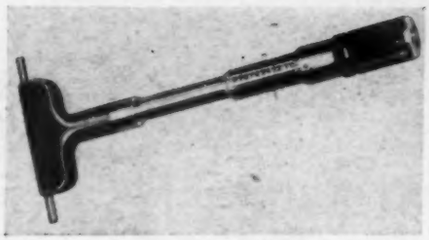
The generator is manufactured in 16-, 22- or 33-kw. capacity sizes. It is said that 400-F. operating temperature requires only 15 psi.

Crozier's Toolpost Turret Holds Four Tools on Lathe



A toolpost turret, developed by Crozier Machine Tool Co., 684 N. Prairie Ave., Hawthorne, Calif., is designed to cut down set-up time in lathe work. It holds four tools and is indexed by opening the handle and revolving the turret manually.

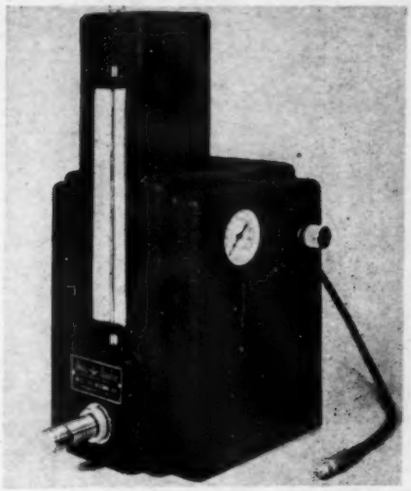
Pre-location is automatically determined by a detent mechanism, and when the turret has been revolved, the handle is closed. Available in small, medium and large sizes, the turret is bolted on lathe.



INSIDE MICROMETER—"Rimat" takes direct reading. To measure back of flange or boring recess, tool is inserted, measurement taken, pins retracted, tool withdrawn. Made with range of 1 in. in two sizes: 3- to 4-in. size with extra measuring rods up to 6 in., and 6-in. size with extra rods to 12 in. Made by Richards Machine Tool Co., 124 S. Isabel St., Glendale 5, Calif.

MARKING MACHINE—Model No. 253, made by The Noble & Westbrook Mfg. Co., 17 Westbrook St., East Hartford, Conn., marks designs and names into thin-wall lipstick cases or similar parts up to ¾-in. dia. (or larger, if specified). 10 loading stations on dial revolve by means of built-in motor, carrying work between marking die and pressure dial. Parts automatically ejected down chute at rate of 60 to 80 per min.

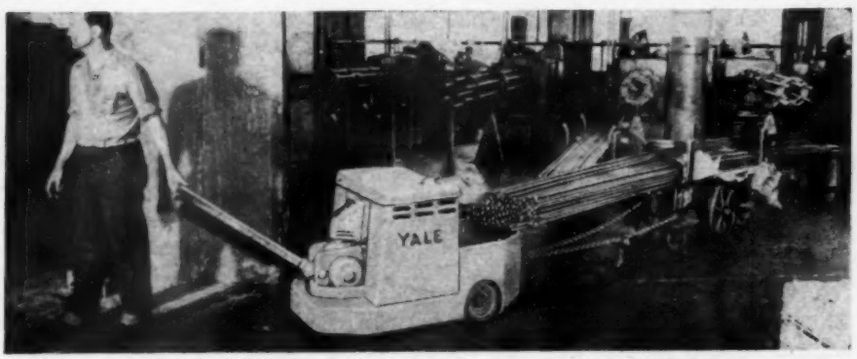
Merz Pneumatic and Taper Gages Use "Reversed-Flow" Principle



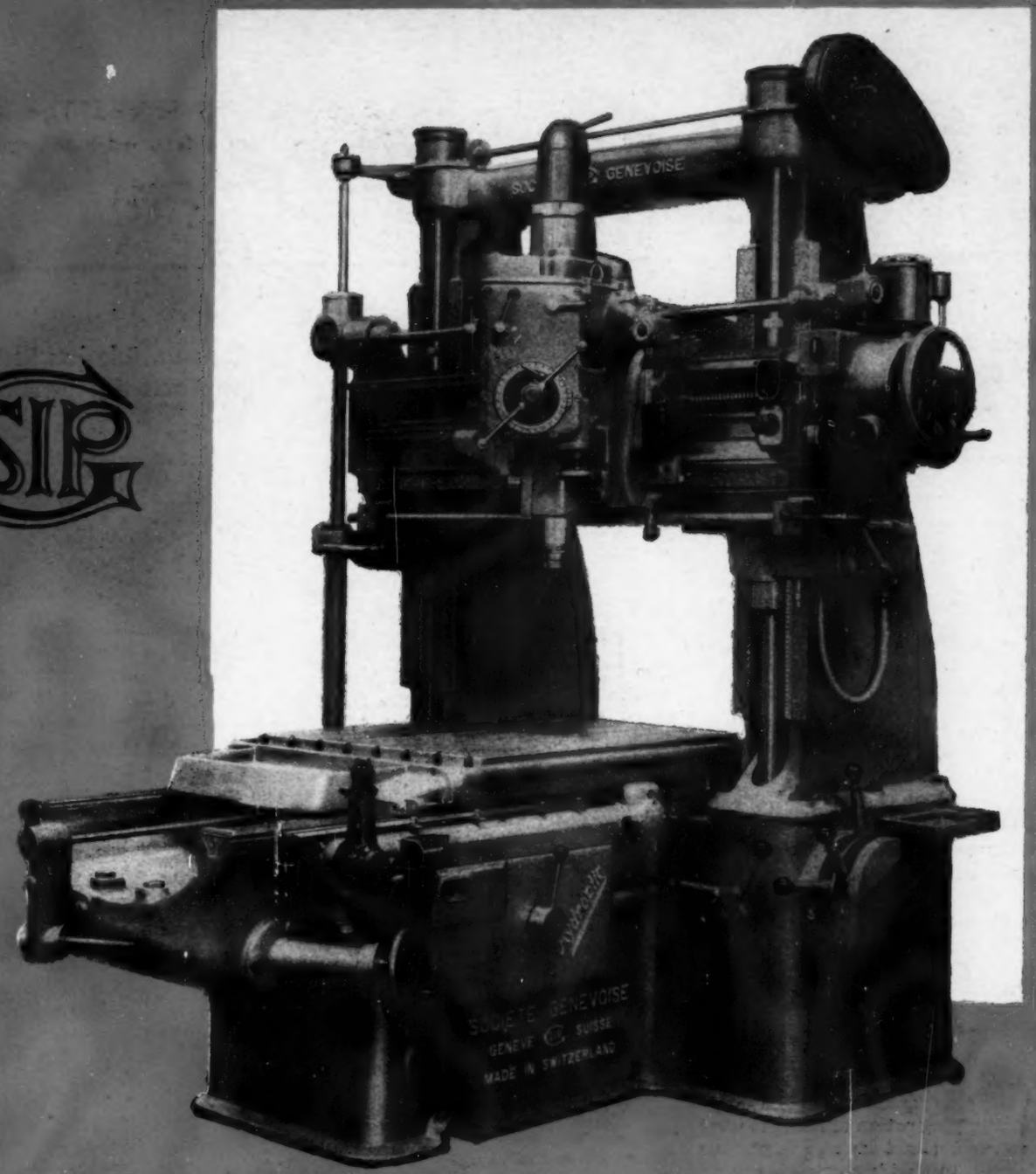
A line of pneumatic and taper gages, known as New-Matic, is made by Merz Engineering Co., 200 S. Harding St., Indianapolis 7, Ind. The line incorporates the "reversed-flow" principle which provides a calibrated measurement scale of the required magnification and a "zero" adjustment for returning the calibration to a basic value. Use of setting masters is unnecessary.

The gages serve as measuring machines as well as comparators and are made in five models. The illustrated "Master" New-Matic, one of the line, offers a standard calibrated scale for any required magnification to 20,000:1.

Taper gages consist of two New-Matic gages equipped with a special fixture incorporating large and small taper-gaging rings made of hard steel. Taper variation is registered on one gage and out-of-roundness is shown on the second dial.



TOWING UNIT—Worksaver Tractor for heavy ungainly trailer loads has three 10-in. dia. wheels with 5-in. rubber tires. Short turning radius made available by 30-in. distance between front and rear axles. Powered by electric storage battery, guided by operator. Made by Philadelphia Div., Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia 24, Pa.



HYDROPTIC-B

Boring
Drilling
Milling and
Measuring

Milling can be performed on this machine as well as boring and drilling. Special milling cutters for slotting and surfacing have been developed for use with the Hydroptic-B, and a depth measuring device adds still further to its versatility.

A built-in optical measuring system, which is free from wear and mechanical stress, insures the accuracy of the Hydroptic-B. This machine is famous throughout the world as the most reliable basis for accuracy for all shop measurements.

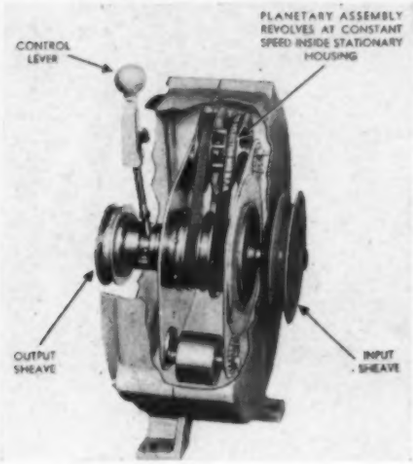
Guaranteed Accuracy for All Settings of Work Table and Spindle Head . . . 0.0002"

COSA CORPORATION

625 Chrysler Building New York 17, N. Y.

Parts and Materials

Speed Selector Transmission Gives Any Speed to 800 rpm.



An improved Variable-V-Planetary infinite-ratio speed selector is jointly announced by Speed Selector, Inc., Cleveland, Ohio, and The B. F. Goodrich Co., Akron, Ohio. An independently mounted transmission, the selector employs planetary motion with four variable-pitch sheaves and two standard cross-section V-belts. It provides any speed from 0 to 800 rpm. at constant torque from constant-speed power source.

Multiplying action of the planetary converts a slight change in sheave pitch dia. to a wide change in output speed. High belt speeds are said to be nearly constant and to permit almost instantaneous change in output speed by means of the lever-action, self-locking control handle.

Models are available in ½-, 1- and 2-hp. output. Optional V-belt or flexible-coupling input permits applications including machine tools, plastic machinery, pumps and process machinery.

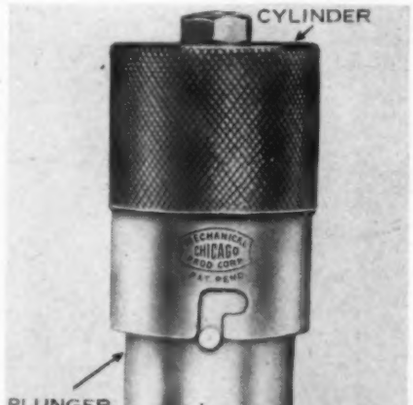
Blu-Blak Oxide Coloring Treats All Types of Steel

Blu-Blak, an oxide-coloring process for treating all types of steel, has been announced by Protective Coatings, Inc., Box 3985, Detroit 27, Mich. Originally developed for the firearms industry as a gun-bluing, the material colors steel at temperatures from 250 to 295 F. Parts are immersed in bath for 15 to 60 min.

Blu-Blak is said to penetrate to maximum depth (0.0001 to 0.0004 in. depending on hardness) and then color from the inside out. Foreign matter rises to the surface of the bath to be skimmed off, and the bath is said to be used as long as 18 months without forming sludge.

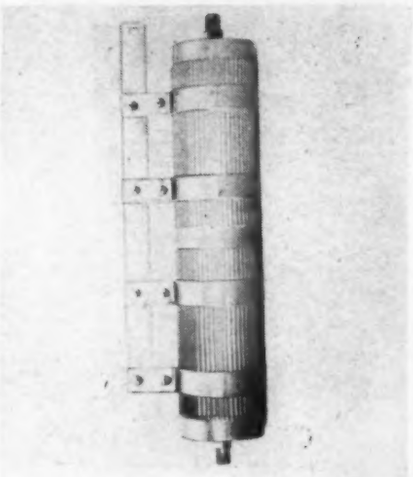
A. O. Smith SW-16 Electrode Performs Light-Gage Welding

The SW-16 electrode for light-gage welding of mild steel in the sheet metal field is announced by A. O. Smith Corp., 3533 N. 27th St., Milwaukee 1, Wis. A high-speed, heavy-coated electrode for all-position welding, it is said to produce a bead contour that requires little finish grinding and to have characteristics that guard against bead sagging and burning through.



TEST PLUG—"Hydro-Matic" self-sealing low-pressure plug for hydrostatic or air testing to 100 psi. Used on tanks, boilers and other receptacles for internal testing, it employs a bayonet-lock construction. Made by Mechanical Products Corp., 168 N. Ogden Ave., Chicago 7, Ill.

Ion 250-amp. Selenium Rectifier Uses Circulating-Liquid Cooling

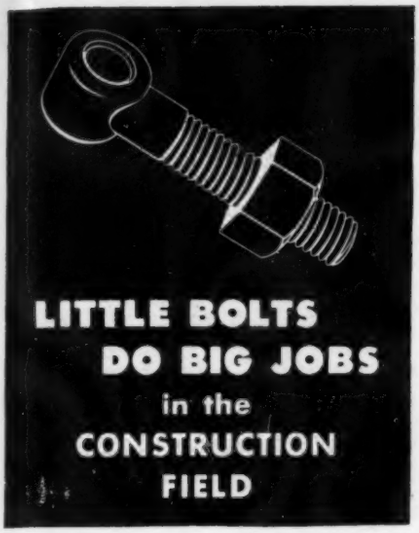


Selenium rectifiers produced by electrolytically depositing selenium are announced by Ion Industries, Inc., Riverdale, Chicago 27, Ill. Cylindrical in shape and using circulating-liquid cooling, the rectifiers are constructed in standard 250-amp. elements. Assemblies can be made in number needed for output required, connected in series or parallel.

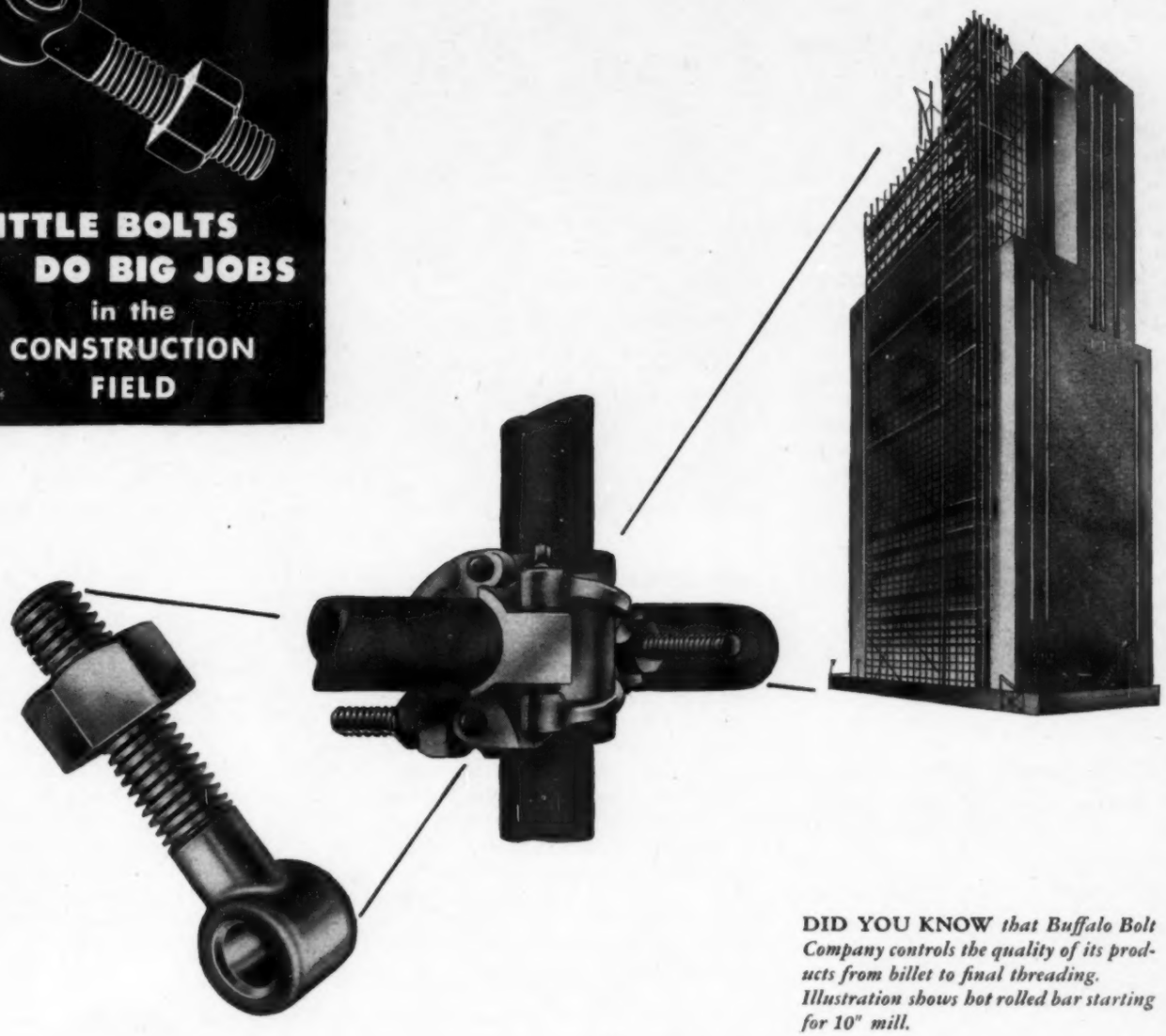
Applications include metal deposition, refining, surface treatment and welding applications. The element illustrated is Standard S-300 Unit rated at 250 amp. continuous, 500 amp. intermittent. Size is 16x3x6¼ in. Weight is 4 lb.

Oiltrol Pressure-Activated Unit Detects Oil-Pressure Level Drop

Oiltrol, an oil-pressure activated safety device for pressure-lubrication systems, is announced by Oiltrol Co., 2550 15th St., Denver 11, Colo. It is installed in lubrication systems, and when pressure drops below safe operating levels, the switch is activated and energizes danger signals or emergency controls of any desired type. The only alteration in existing lubrication systems is addition of a spur oil line to carry oil pressure to the unit.



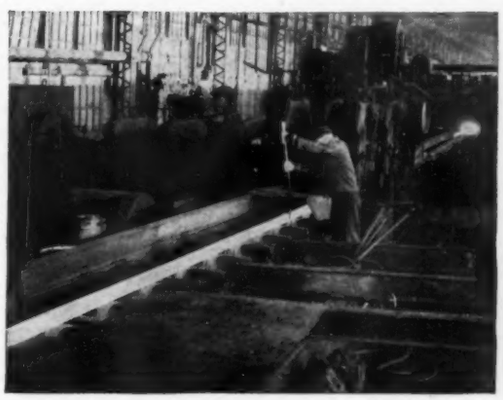
LITTLE BOLTS DO BIG JOBS in the CONSTRUCTION FIELD



DID YOU KNOW *that Buffalo Bolt Company controls the quality of its products from billet to final threading. Illustration shows hot rolled bar starting for 10" mill.*

● Modern scaffolding makes it possible to erect or renovate large structures with unbelievable speed, efficiency and safety . . . an accomplishment in which small fasteners play a highly important part. For it is upon the strength and reliability of fasteners such as the special Circle Ⓑ Bolt illustrated that the ultimate utility of the scaffolding depends.

Circle Ⓑ Fasteners have a long-standing reputation throughout industry for dependability . . . for uniform size and strength. That's why you will find Circle Ⓑ Bolts and Nuts . . . standard and special . . . used so extensively on such a wide variety of well-known products.



Ⓑ BUFFALO BOLT COMPANY

NORTH TONAWANDA, N. Y. · SALES OFFICES IN PRINCIPAL CITIES

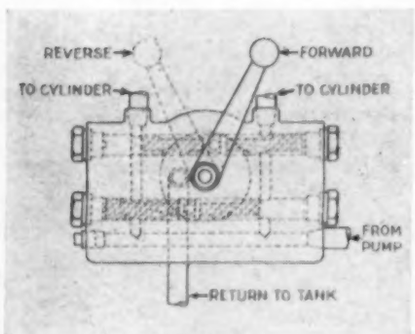
Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

Xactline Capacitrol Instrument Controls Temperature Variance

The Xactline Capacitrol, a temperature-variant control instrument, has been announced by Claud S. Gordon Co., 3000 S. Wallace St., Chicago 16, Ill. The instrument combines the features of the Claud S. Gordon Xactline control unit and the Wheelco Instrument Co. electronic-principle Capacitrol. Applications include electric furnaces or ovens and electrically heated injection-molding machines.

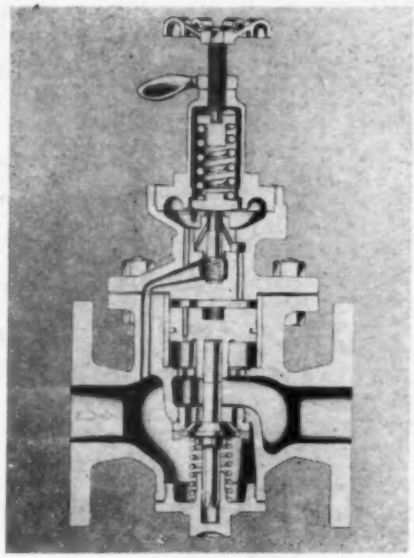
Xactline features include simple adjustment for wide-range control requirements, temperature control said to be as close as ± 1/5 F., and positive electrical action without gears, cams, motors or bearings. Capacitrol features include instantaneous control action, direct reading, separately enclosed measuring instrument and interchangeable unit construction. The Xactline Capacitrol is available in two models and has the same hook-up as the Model No. 244 Pyrometer Controller.

"Rite" Hydraulic Cylinder Valve Obtains Reversal from Cylinder



The "Rite" four-port hydraulic cylinder valve, made by R. I. Task Enterprises, Inc., is available from Morse Boulger Destructor Co., 205 E. 42nd St., New York 17, N. Y. For the control of all types of reciprocating hydraulic cylinders, the valve obtains full reversal actuation from the cylinder itself.

The reverse lever swings through 45° and reverses the cylinder with as little as ½-in. travel. Positive dog or lever actuation of the reverse lever can be used. By means of a shut-off knob, the lever can be moved to any position without causing cylinder movement. Operating pressure is 50 to 300 psi., and speed is to 500 cycles per min. Mounting is supplied in flange, bracket or face types. Special models are available.



Leslie UL Unloading Valve Used with Steam, Air or Gas

A throttling-type unloading valve, class UL, is made by Leslie Co., 129 Delafield Ave., Lyndhurst, N. J. Used with steam, air or gas, it serves where a throttling-type regulating valve is required to maintain constant inlet pressure by relieving excess to a lower pressure system. Said to have quick action under sudden pressure variations, it is available from ½ to 4 in., for inlet pressures from 25 to 300 psi., inlet temperature to 550 F. and pressure difference of not less than 15 psi.

Silver-Chip No. 60 Cutting Oil Mixes with Any Hardness Water

Silver-Chip No. 60 cutting and grinding oil is available for delivery from Machinery Lubricants, Inc., 31 St. James Ave., Boston 16, Mass. The product is said to mix with water of any hardness and produce a solution instead of emulsion. Mixtures of 1:25, 1:50 and 1:100 are said to produce transparency as well as high lubricity.

Penetone Co. Cutting Fluid Lubricates, Cools and Cleans

A triple-acting cutting fluid is announced by The Penetone Co., Dept. 12, Tenafly, N. J. Said to combine the requirements of lubrication, cooling and cleaning, the product is a non-toxic, non-inflammable liquid concentrate. It is diluted with approximately 15 parts of water for use as a cutting fluid.

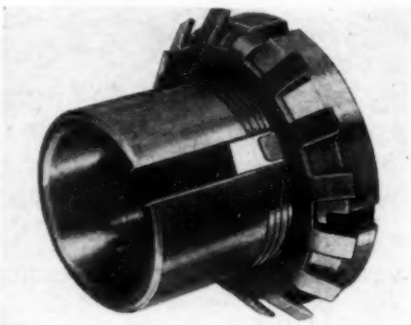
D. C. Cooper Oxidizing Compound Produces Black Finish on Steel

D. C. Oxidizing Compound for producing uniform black finish on steel parts is announced by D. C. Cooper Co., 1467 S. Michigan Ave., Chicago 5, Ill. An alkaline salt which is mixed with water, the compound is said to produce a finish that will not peel, rub off, crack or chip, and that is rust resistant. A single bath from 5 to 15 min. is required, and the application is said not to change dimensions of the treated part. The product is used on machine parts, bearings, axles and other parts.

Eutectofilm Metallic Coating Applied to Bare Welding Rods

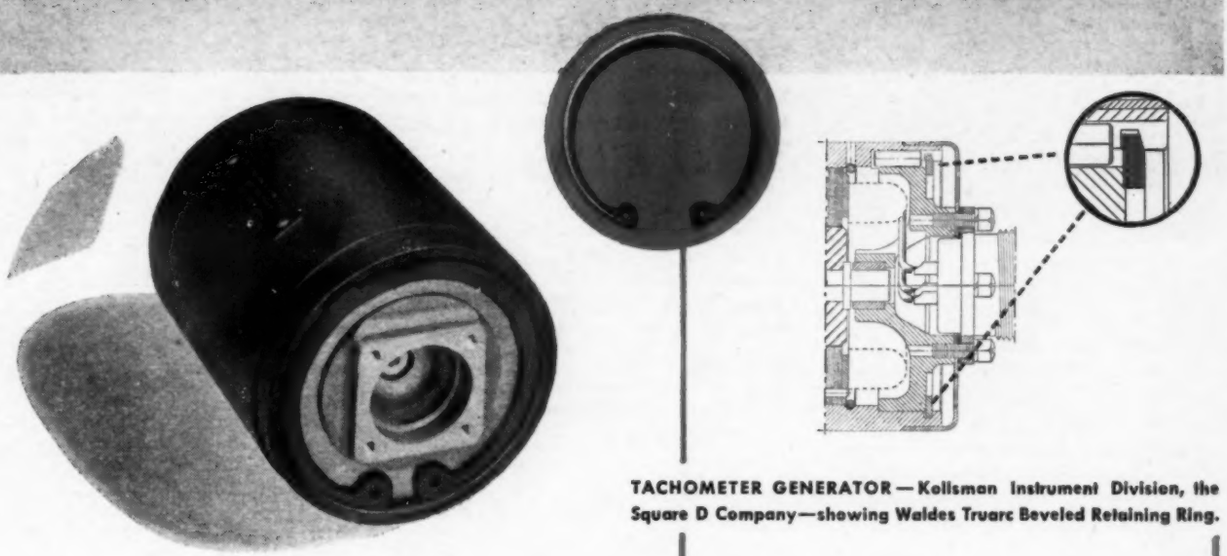
Eutectofilm, a metallic coating applied to bare welding rods, is announced by Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y. The coating is said to improve welding-rod characteristics, insure the obtaining of high physical properties in the deposit, assist in surface alloying at low base-metal heats, and to protect the filler metal from corrosive attack. It is now standard on most EutecRods for torch applications.

Also available is a low-heat welding rod for zinc die castings, cast iron, steel, copper, brass, aluminum, and for overlaying.



BEARING ADAPTER—Made by Standard Locknut and Lockwasher, Inc., 311 N. Capitol Ave., Indianapolis 4, Ind. Adapter is designed to permanently hold inner race of tapered bore bearings to straight shaft during rotation, is said to obtain full advantage from anti-friction bearings. Adapter consists of locknut, lockwasher and sleeve. If nut is removed, the shaft is easily removed from bearing and adapter disassembled. Adapters available to fit 1-3/16-, 1-7/16, 1-15/16- and 2-3/16-in. shafts

Truarc Beveled Ring takes up end-play, eliminates shims, saves 20 minutes' assembly time



TACHOMETER GENERATOR—Kollsman Instrument Division, the Square D Company—showing Waldes Truarc Beveled Retaining Ring.

When installed in a groove with a corresponding bevel, the tapered edge of the Beveled ring acts like a wedge and rigidly bridges end-play. End-play can also be taken up resiliently by another type Truarc ring—the Bowed.

Wherever you use machined shoulders, nuts, bolts, snap rings, cotter pins—there's a Truarc ring that does a better job of holding parts together. All Truarc rings are precision engineered, easy to assemble and dis-assemble, always circular to give a never-failing grip. They can be used over and over again.

See what can be done for your product: send a drawing to Waldes Truarc Technical Service Engineers for individual attention without obligation.

One Waldes Truarc Beveled Retaining Ring gives Five big advantages:

- **Secures the cover with its connecting parts in the housing against strong pressure, heavy vibration**
- **Absorbs accumulated tolerances up to .010 (ring diameter is 1.9375)**
- **Eliminates shims, saves material and weight**
- **Saves 20 minutes' assembly time**
- **Simplifies field maintenance by facilitating quick dis-assembly, re-assembly**

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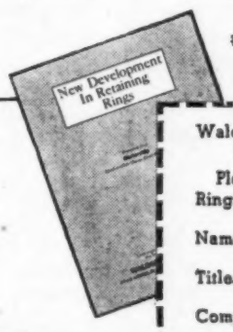
TRUARC
Reg. U. S. Pat. Off.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

Canadian Distrib.: Controlite Engineering & Sales Ltd., 20 Bloor Street W., Toronto 5



Mail this coupon today for your copy of "New Development in Retaining Rings"

Waldes Kohinoor, Inc., 47-10 Austel Place 12-P
Long Island City 1, N. Y.

Please send booklet, "New Development In Retaining Rings" to:

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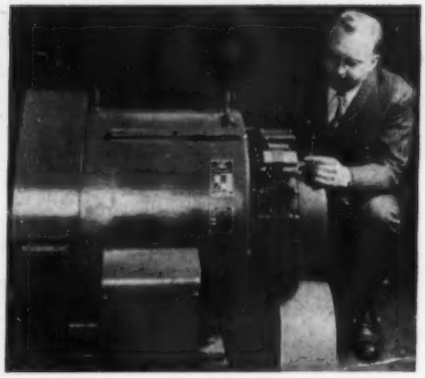
WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,302,948; 2,020,484; 2,416,852 AND OTHER PATS. PEND.

Electric Machinery Generators Power High-Frequency Tools



Generator sets for powering high-frequency portable tools have been developed by Electric Machinery Mfg. Co., Minneapolis 13, Minn. A "Regulectric" voltage-regulating circuit is built into the generator to instantly restore voltage to normal whenever there is a change in load.

The sets are rated at 31.3 and 63 kva., 240 or 480 v. at 180 or 360 cycles. The end-cover of the 31.3-kva. 180-cycle generator illustrated has been removed to point out elements of the "Regulectric" circuit, which has no moving parts and operates on the principle of electrical resonance.

Reid Brothers Phase Converter Permits Lower Voltage Lines

A phase converter designed to provide standard voltage where only 110 v. single-phase current is available is announced by Reid Brothers Co., Inc., Beverly, Mass. It changes the current to 220-v., 3-phase current and drives any machine or machines up to 1½-hp. capacity.

Measuring 12 in. high, 22 in. long and 15 in. wide, it is completely encased in a sheet-steel case except for switches. There is only one moving part to be lubricated. The unit eliminates the necessity for running in a higher voltage line.

Turco Transpo Cleaning Agent Strips Carbon, Paint and Oil

Turco Transpo, a rapid cleaner for stripping carbon, paint, oil and other foreign matter from automotive and aircraft engines and parts, is announced by Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif.

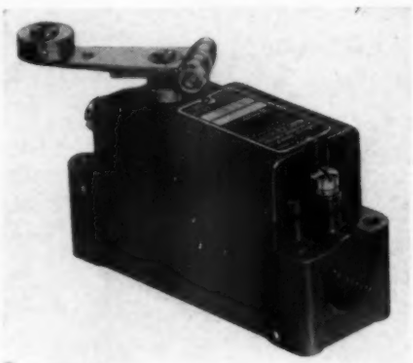
The material is most effectively used at temperatures from 65 to 85 F. Non-inflammable and virtually odorless by means of a liquid seal, it is said to have exceptionally long tank life. It is non-corrosive to aluminum, magnesium, cadmium plate, tin, cast iron, zinc and steel.

Harnischfeger Nicast Electrode Produces Welds in Any Position

A P&H cast-iron electrode, Nicast, is announced by Welding Div., Harnischfeger Corp., Milwaukee 14, Wis. Made for either ac. or dc. operation, it produces welds said to be non-porous and fully machinable in both weld and fusion-zone areas.

An all-position electrode, Nicast is available in ⅛- or 5/32x14-in. sizes. Most applications require no preheating or post-heating and the electrode has uses including repairing or building up castings, correcting machining errors and welding cast iron to steel.

Square D Tool Limit Switch Has Roller Arm or Push-Rod



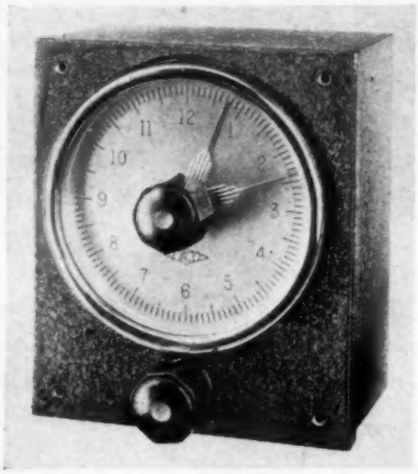
A precision snap switch in oil-tight enclosures suitable for machine-tool limit-switch applications is made by Industrial Controller Div., Square D Co., 4041 N. Richards St., Milwaukee 12, Wis.

Surface- and flush-mounting arrangements are available with roller-arm or push-rod operated mechanisms. The cover and switch assembly can be rotated 180° to place the ½-in. conduit entrance at the other end.

Roller-arm types require 5° travel for operation and are provided with 25° overtravel in either direction. They can be adjusted to any position on the circle. Return springs are reversible or may be removed for maintained-contact action. Arms are available from ⅞ to 3 in. long, with standard ⅝-in. dia. ¼-in.-wide rollers.

CorOdex Liquid Rust Remover Acts on Any Metal Surface

CorOdex, a liquid rust remover is produced by Allied Products Co., 1133 W. Newport St., Chicago 13, Ill. Said to be effective on any metal surface and to reach pin-point spots, it can be applied with paint brush or cotton swab. It is claimed that CorOdex requires no rubbing, can be used for dipping, is non-explosive and non-inflammable, and will not injure hands of user. Longer immersion coats surfaces with a blue-black oxidized finish which increases corrosion resistance. It is said that a few minutes of application will dissolve light rust.



TIMER—Dico Universal timer operates on 110-v. ac., times multiple operations in sequence or simultaneously. Can time four loads independently within one set cycle. Has two separate single-pole double-throw switches, small synchronous motor, two control knobs. Made by Diamond Instrument Co., Wakefield, Mass.

Airco Electrode for Cast Iron Gives Machinable Weld Deposit

An electrode for machinable welds on cast iron has been announced by Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. Known as Airco No. 375, the electrode has a high-nickel core wire and a heavy extruded coating. Ordinary preheating is not necessary.

The nickel content permits easy flow, and the electrode is said to withstand hydrostatic pressure and to be usable in downhand, vertical or overhead positions. It may be used on ac. or dc. and comes in 5/32- and ⅛-in. dia.

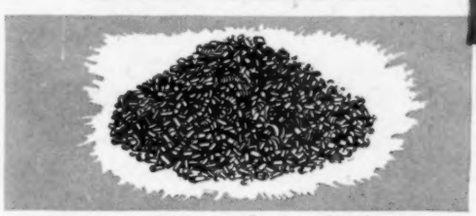
POUND FOR POUND...

...get 3 times as many finished parts!

HIGHER SPEEDS

R317-T can be run at high-profit speeds, comparable or in some cases, higher speeds than brass.

CLOSER TOLERANCES



R317-T machines easily to a bright, natural finish. Forms small chips. Does not run with the tool. May be worked to very close limits.

LOWER-COST MACHINING

Accurate volume production with fewer rejects. Result: lower cost, more profit per finished part.

Yes—thanks to the favorable weight factor aluminum gives you three times as many finished parts per pound as brass.

By the foot you pay less for aluminum than you do for brass. All of which adds up to a saving of about 50% in material cost.

For high speeds, excellent machinability, a bright, natural machine finish and LOWER COSTS, use R317-T, Reynolds new aluminum screw machine stock. Only a fraction of the cost per finished piece as R317-T weighs only ⅓ as much as brass (and other heavy non-ferrous metals).

Order now. R317-T is ready for immediate shipment from Louisville warehouse stock in rounds and hexagons in all standard sizes. 17S-T, Reynolds standard screw machine stock, is also available now.

Consult Reynolds. Reynolds is ready to work with your engineers. Offices in principal cities. Phone nearest office . . . or write Reynolds Metals Company, Aluminum Division, 2523 South Third Street, Louisville 1, Kentucky. See Sweet's or write for Catalog 100-B "Reynolds Aluminum—Available now for Today's Products."

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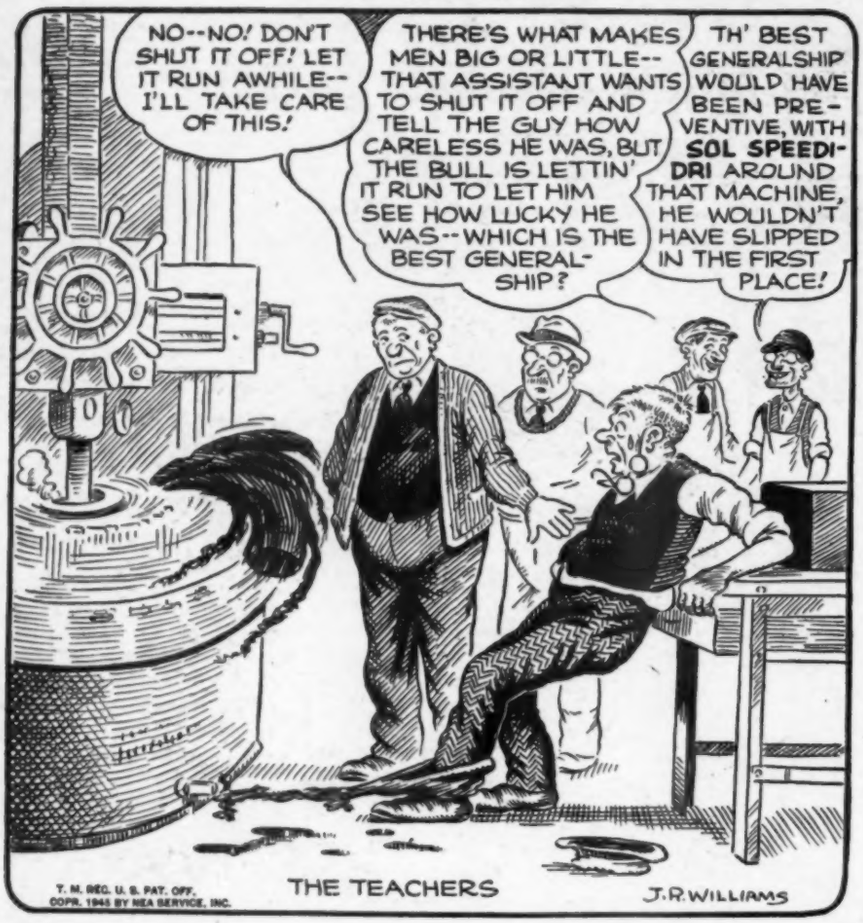
REYNOLDS METALS

REYNOLDS

The Great New Source of **ALUMINUM**

INGOT · SHEET · SHAPES · WIRE · ROD · BAR · TUBING · PARTS · FORGINGS · CASTINGS · FOIL · POWDER

OUT OUR WAY


NO--NO! DON'T SHUT IT OFF! LET IT RUN AWHILE-- I'LL TAKE CARE OF THIS!
THERE'S WHAT MAKES MEN BIG OR LITTLE-- THAT ASSISTANT WANTS TO SHUT IT OFF AND TELL THE GUY HOW CARELESS HE WAS, BUT THE BULL IS LETTIN' IT RUN TO LET HIM SEE HOW LUCKY HE WAS--WHICH IS THE BEST GENERAL-SHIP?
TH' BEST GENERALSHIP WOULD HAVE BEEN PRE-VENTIVE, WITH SOL SPEEDI-DRI AROUND THAT MACHINE, HE WOULDN'T HAVE SLIPPED IN THE FIRST PLACE!
T. M. REG. U. S. PAT. OFF. COPR. 1945 BY NEA SERVICE, INC.
THE TEACHERS
J. R. WILLIAMS

SAFETY FIRST AND LAST WITH "SOL-SPEEDI-DRI"

SOL-SPEEDI-DRI soaks up soluble oils, resins, syrups, solvents, acids, coolants, and regular oils and greases like magic. It makes oil-soaked floors safe for walking, safe for working. SOL-SPEEDI-DRI reduces the danger of fire — for it will not burn. It requires no expensive machinery — no trained personnel — for its use. SOL-SPEEDI-DRI works — while your employees work in safety!

Safety and Maintenance Co., Inc., No. 1 Wall Street, New York 5, N. Y.

Warehouse stocks maintained in principal cities of the United States and Canada

ROUND TABLE Discussion

DO ROLLING STONES GATHER POLISH?

There are men who wander because their abilities and usefulness are of a negative character and no firm desires to retain their services for long. Such men are of little use.

The best types of rolling stones are those who move about in order to gain experience. The man who stays in one shop all of his life has an experience and knowledge which is confined to that work alone. Having no idea of how other shops operate, he has no basis of comparison and, therefore, can exercise no judgment concerning the efficiency of the methods he is employing. A poet once said, "What knows he of England, who only England knows." This could be rendered, "What knows he of efficiency who only one shop knows." The conceit of the one-shop man is sometimes insufferable.

It used to be the custom for young mechanics to be advised to leave the shop where they had learned their trade, and, for a period of not less than five years, travel from shop to shop, remaining not more than one year in any one place. Then, having gained experience, they could select the shop and district where they would like to settle down and become steady members of some works personnel; being rolling stones no more.

J. E. Powell
Lincoln, England

•

WHO PAYS FOR BREAKAGE?

Occasionally I come into my den, where I spend my many idle hours, withdraw the key from my pocket and open up my glistening oak toolbox. The lining on the bottom of the small drawers emits odors of lard oil that make my graying head swim with happy reflections as I contemplate the glorious years I spent amid the squeak of struggling belts, gnashing of abused gears, and particularly the many happy hours associating with my workmates.

I look over each idle tool and ask myself if one of my former employers should not have been held responsible for any damage inflicted upon them in the course of my daily efforts. (There is a chance that I may be compensated for retroactive damage—or portal-to-portal abra-

from disc to cup

in one draw—calls for *Firthaloy* QUALITY DIES

This difficult operation, —a one-draw, severe reduction, required a correctly designed die with Firthaloy for wear resistance in the hole, and hardened top face for wear resistance against wrinkling.

There's more to a good deep drawing die than simply a carbide insert in a steel casing. Firthaloy engineering skill based on past experience in the deep-drawing field; correct design based on established practice; proper selection of materials; accurate specifications to meet the individual needs of the case . . . are reasons why FIRTHALOY DIES assure size control, surface finish, trouble-free operation, long life and low die cost per piece.

Call **Firth Sterling**
STEEL & CARBIDE CORPORATION

FIRTHALOY

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FOR THAT EXTRA EDGE IN PRODUCTION!

I-T-E Circuit Breaker Co. Reveals 57% Reduction In Slotting Time!

Nelco Carboloy-Tipped Tools Cut 100 Slots IN 1.4 HOURS

Instead of former 3.2 hours with usual type steel cutters

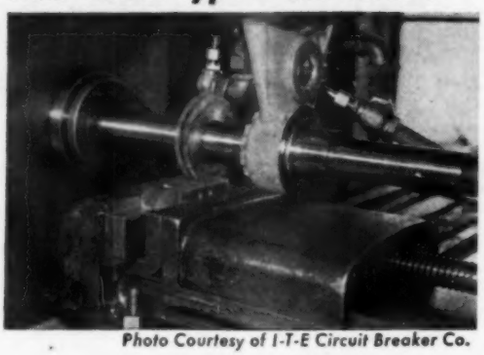


Photo Courtesy of I-T-E Circuit Breaker Co.

In Gangs of 2 (Sometimes 3) Nelco Carboloy-Tipped Cutters Set New Records In Doubling Production

Compare This Operation Record Now!

Job: Cut slot ½" deep, 5" long, .252 wide.
Material: Hard extruded copper terminal block.
Machine: Kearny & Trecker, 20 CSM Milling Machine, Horizontal Type, Spindle RPM of 1250.

With Usual-Type Steel Cutters

3.2 hours to cut 100 slots.
Table feed of 5⅛" per min.
Did not hold size due to high amount of wear caused by hard copper.

WITH NELCO CARBOLOY-TIPPED CUTTERS

1.4 hours to cut 100 slots.
Table feed of 90" per min.
3200 slots obtained before dulling or loss of size occurs.

NELCO TOOL CO., INC.
For That EXTRA EDGE In Production
370 Hamilton Avenue, Dept. 4 Brooklyn 31, N. Y.

All Nelco Tools are designed and made to make production faster, better, cheaper. Write for the new Nelco catalog today—and for the name of the Nelco distributor nearest you.

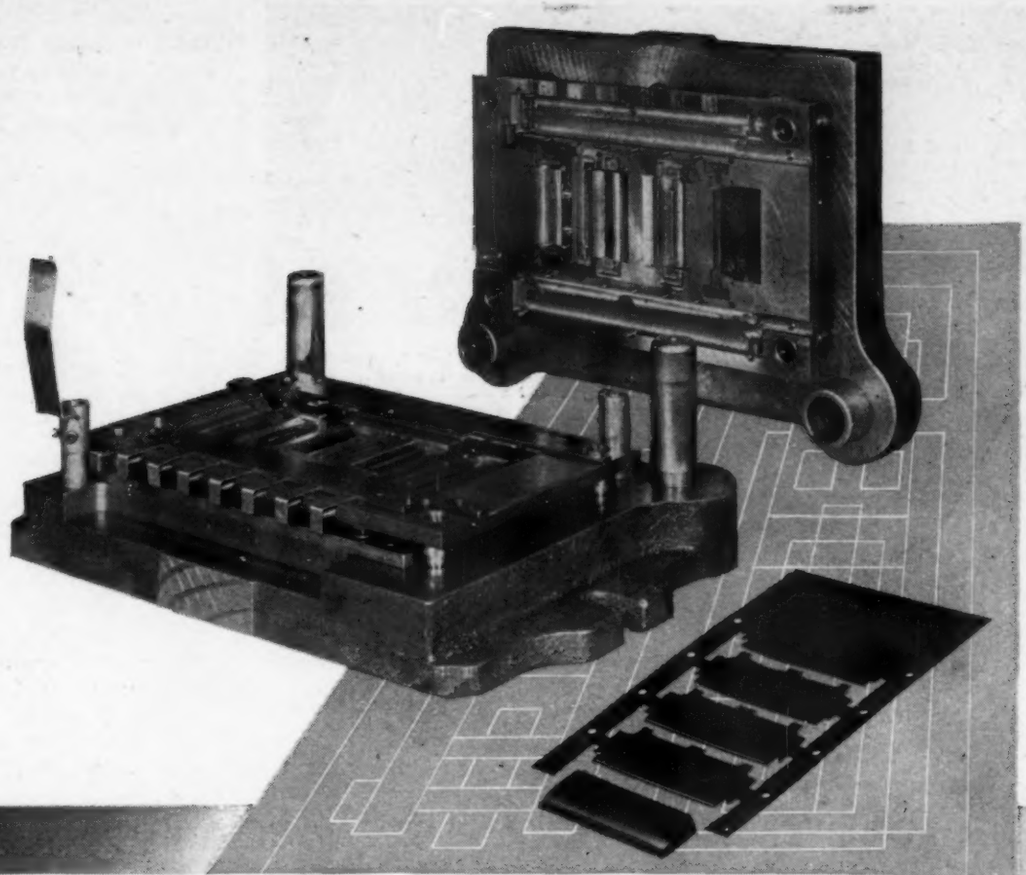
sions). Should I have held the Dutch Fit Mfg. Co. responsible for the loss of my 4-in. outside and inside toolmaker's calipers? What about the expense I was put to when I sent my 1-in. micrometer away for repairs? I couldn't help it if it slipped from my fingers and hit the hard floor. That misfortune set me back to the tune of $2.60 (No tax in those days).

Billy Green had an accident with one of my swell ground-and-lapped parallels. Poor Bill had a large family to support and had a hard time to make ends meet. I hadn't the heart to insist that he get me a new one. Maybe I should have called upon the company to replace it.

What if I had called upon my former employer to replace the many small taps and drills that I have broken in the many years? True it is that I broke them while performing work on the company product, but, would my face have been red if I had been asked what I paid for them! It is one of the mysteries of the game how those things will creep into one's toolbox over a period of years!

If the foreman had asked me to lend the expensive parallel to Bill, I would have been justified in insisting that the company replace it. The chances are that I would have incurred the friendly foreman's displeasure in being so stingy. As it was, I do not see where the employer could have been held responsible; it was entirely a matter between two of his workmen. If, in the case of the damaged micrometer, I had been in the process of seeing that the diameter of the work was "on the money," and a clumsy millwright accidentally konked me on the noggin with a 2x6 as he turned around to watch a well-molded office worker pass by, I think I could have collected for an accident which any court of law would have held the company responsible.

I like to feel toward an employer as I would like others to feel toward me if I were in his place. However, I do feel that there are times when management should assume the worker's share of financial outlay. I have never felt it incumbent upon a worker to withstand the expense of having his dirty apron or overalls laundered. Were I an employer —and God forbid in these hectic days—and the condition of the shop floor was such as to impose undue wear and tear on the workman's shoes, I would certainly rest better at night if I stood the expense of their repair. I do not look upon employers as being a bunch of suckers, although at times some have proved



Blueprints to happy tunes...

with the right dies

Atlas "precisioneering" produces thousands more harmonica stampings with minimum maintenance

A stamping is no better than the dies which produced it. That's exactly what a manufacturer of well-known harmonicas proved on his production line.

It was Atlas "precisioneering"—the scientific application of engineering, skilled craftsmanship and Nth degree accuracy—that made this possible.

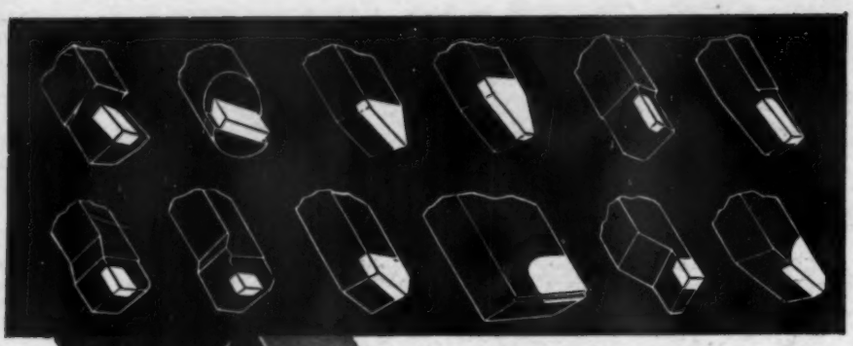
As shown in the above illustrations an Atlas precision-produced, progressive die turns out harmonica parts quickly, economically and in greater numbers. This die has been engineered to emboss the name on the steel blank . . . stamp out the development contours . . . form the interlocking lips . . . give the final forming touches . . . and then automatically eject the piece from the die.

Whatever your problem in metal stamping or tool and die design take advantage of "Atlas Precisioneering." Our help starts before the blueprint and ends with the finished product. Let our staff of 250 skilled engineers, designers and tool makers prove "a load off your shoulders onto ours" may be your answer to increased production and lower costs. Write . . .

DESIGNERS ATLAS BUILDERS
TOOLS AND DIES
JIGS AND FIXTURES
SPECIAL MACHINERY

ATLAS METAL STAMPING COMPANY

Castor & Kensington Aves., Philadelphia 24, Pa.



Wendt-Sonis Standard Carbide Tools are available in a wide variety of types and sizes.

for COST CUTTING . . .

. . . on CUTTING JOBS

- *13 standard Wendt-Sonis carbide tipped tools will perform over 80% of a plant's tool bit operations.*
- *Wendt-Sonis standard tool bits can be supplied with any grade of carbide required.*
- *Standard Wendt-Sonis tool bits are stocked in Carboloy and Kennametal grades of carbide for universal machining operations.*
- *Nationwide sales and service organization of established W-S distributors stocks a complete line of W-S standard products.*

W-S standard tool bits are "Color Marked" for easy identification as to use on steel or non-ferrous materials. All shanks are rust resistant — also heat-treated for greater rigidity. Cutting edges are diamond ground for longer wear and better finish. All these advantages put the Wendt-Sonis line at the top as a money maker for you. Get details!

Free! NEW CHIP-BREAKER CHART

Contains illustrations of chip-breakers, grinding instructions, and recommendations for their use. Chart size — with handy tab for wall hanging. To get FREE chart WRITE: Wendt-Sonis Company, Hannibal, Missouri or 580 N. Prairie Ave., Hawthorne, Calif.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL BITS

to be just that. If they can prove to their workmen that they are interested in worker welfare, I have no hesitation in saying that they will reap the reward in contented producers.

John Homewood
Ontario, Calif.

•

In average cases, workers are more careful in the use of tools owned by themselves or borrowed from shopmates than those that are owned by their employers. While this is not an ideal condition, nevertheless it does exist.

In the case cited, Bill should assume full responsibility for the breakage of the tool he had borrowed and should make good for it with John. However, if Bill can make arrangements with his employer for the employer to replace the tool, then the replacement might be made in a way satisfactory to all concerned. However, Bill should know that the responsibility for making good with John is entirely up to him.

Martin H. Ball
Watervliet, N. Y.

•

Custom varies according to the occupation or trade involved. Apprentices and traveling (tramp) mechanics seldom or never have any tools. Hence the firm owns the latter, consequently must stand the cost of breakage.

It has been my privilege to direct a thousand or more employees upon maintenance work where carpenters, electricians, millwrights, painters, plumbers and unskilled laborers made up the quota.

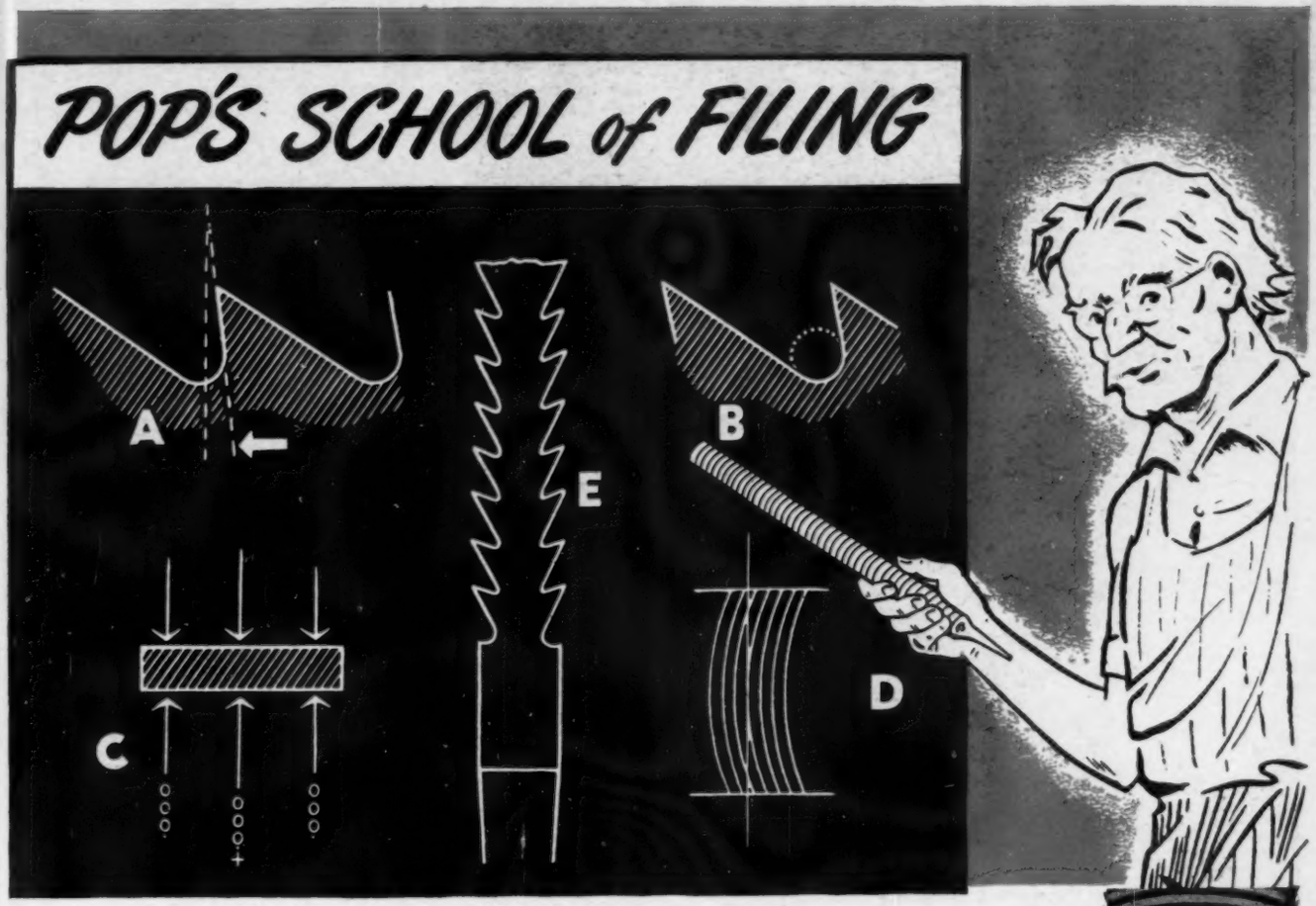
From experience and observation, I believe that practically all men employed in these trades, furnish nearly all of the tools they use. Some of the tools they have made to meet any difficult situation. Many of these tools are strained or bent and some are broken, in use.

Take, as an instance, this case: A millwright slid a piece of pipe 6 ft. long on the handle of a large wrench and three men vented their combined strength against it. Result? Damage, to the wrench, beyond repair, but the wrench held until the job was finished, so the employer had the benefit. The shop did not have a wrench large enough to do the job.

In cases where the workman owns the tools and uses them for the shop's advantage, the firm certainly should make good.

However, before any replacement is made, the foreman of the crew,

POP'S SCHOOL of FILING



"Little things make big differences in curved tooth files"—says Pop the Foreman

• *The right file for the job* means selecting both the *right type* and the *best design* in that type . . . especially in milled curved tooth files — as the technical distinctions in Pop's "lesson for today" indicate.

Nicholson Superior Curved Tooth Files are made as only Nicholson standards of design and workmanship can assure:

(A) Teeth have the proper face angle (positive) for good bite without pinning up.

(B) Gullets are carefully designed and smoothly rounded for minimum clogging.

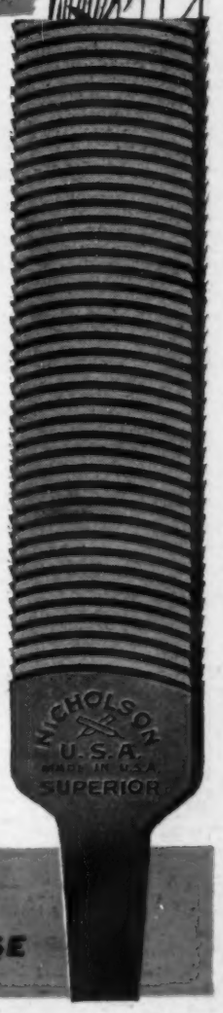
(C) Cross-section has very slight fullness for even tooth wear and level cutting under normal filing pressures.

(D) Tooth radius is designed to keep two or more teeth always in contact, to eliminate chatter with any plane-surface work. Greater shear angle at edges results in smooth cutting with less pressure, less clogging.

(E) Pre-forged tang, with teeth stopped off leaving a clean shoulder below level of teeth-tops, insures strength and allows file to be used as surfacing tool.

Tremendous trifles! Yes, details which, cumulatively, can effect big mass-production savings in man-hour costs — and in file costs as well! In NICHOLSON SUPERIOR brand your industrial distributor can offer you curved tooth files that are really *superior*.

TANGED type (rigid) illustrated. Also made in flexible BLADE type. For non-hard ferrous metals and alloys; aluminum, brass, babbitt, plastics, hard rubber, wood, etc.



NICHOLSON U.S.A. **NICHOLSON FILE CO. • 29 ACORN ST., PROVIDENCE 1, RHODE ISLAND**
(In Canada, Port Hope, Ont.)

BLACK DIAMOND TRADE MARK

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and, in some cases, the plant engineer should inspect the broken article and pass judgment. When justified, in many circumstances similar to these, it has been my custom to place orders with the purchasing department for identical tools, if they are on the market but, if not, then just compensation should be made. If the tool could be repaired, it was delivered to the toolmaking department for attention. In the cases of machinists and toolmakers, I believe the same practice should be followed, because the firm gets the benefit.

If, however, a man frequently breaks tools, his own as well as those he borrows, he should be admonished and be required to show better judgment in their use, or bear the expense of replacements. This procedure has cured many a case.

F. H. Stebbins
Worcester, N. Y.

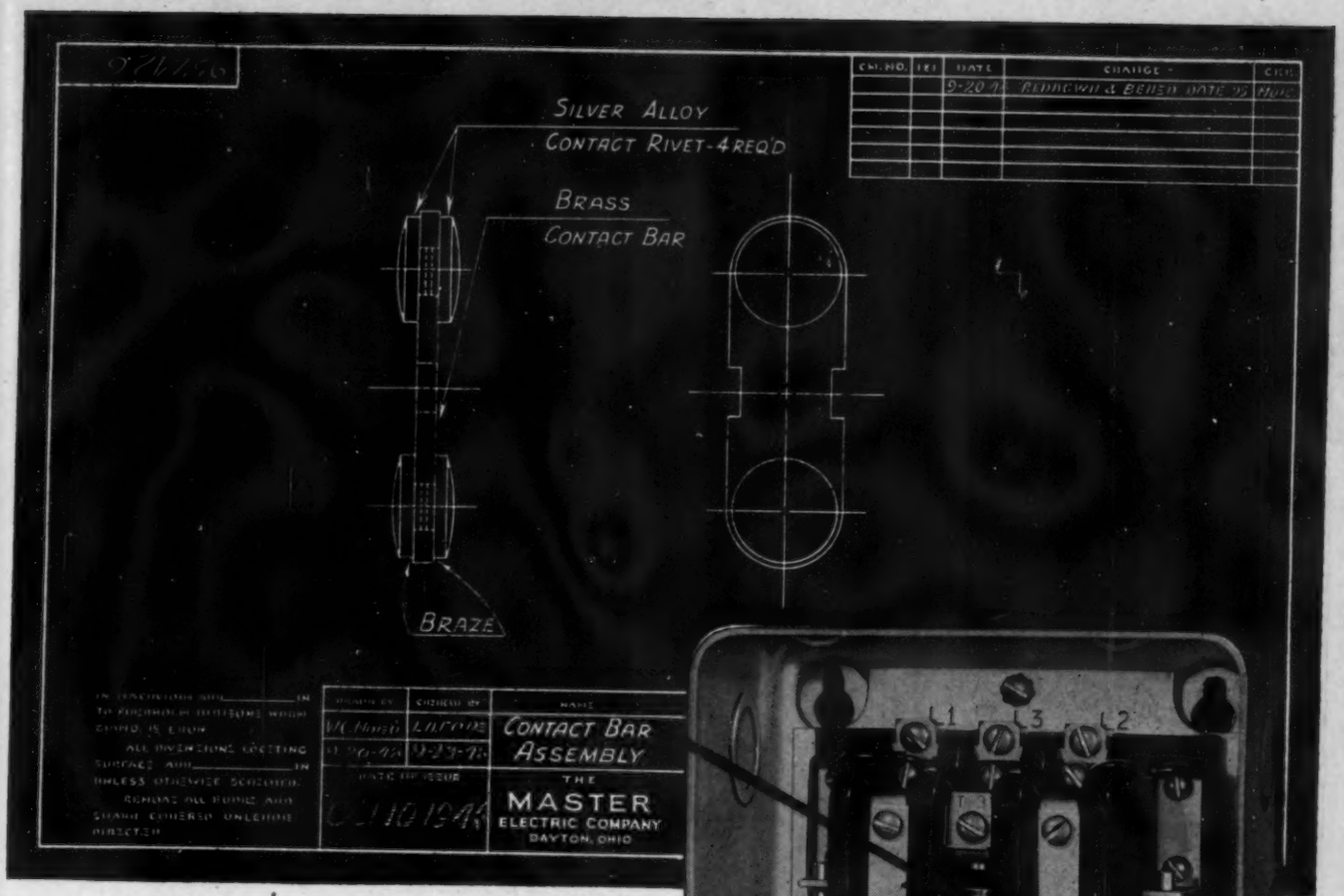
•

Wherever there are many machinists employed, there is always someone like Bill Payne who will not buy tools similar to the indicator he usually borrowed from John Marks. Because he may only use one occasionally (although such a tool will last a lifetime with careful use) he would rather borrow.

However, to expect to bill the company for this tool if it is lost or stolen, would be entirely unfair. I don't believe that, if such a case were taken to court, a judge would find any company to blame, or guilty of any responsibility. Bill Payne borrowed the tool and did not return it in the same condition. Further, he took it without permission. Whether or not he'd borrowed it with permission before has nothing to do with it.

Also, it is quite possible Marks was handicapped while he was getting the indicator repaired (if that was possible) or waiting until he could get a new one.

Al said that if the company supplied all the tools, there wouldn't be any problem. As a matter of fact, that is almost the position in up-to-date concerns today. With the exception of the ordinary calipers and small scales, you can get practically any tool you want on a tool check from shop stores or tool crib. Concerns do this because they want to make sure that all tools necessary to the machining or erection of any job are actually available. Those tools are kept in good shape and periodically checked for accuracy. The yearly cost of measuring tools and tools that are used daily in large plants is tremendous, but it makes for accuracy, helps production, and



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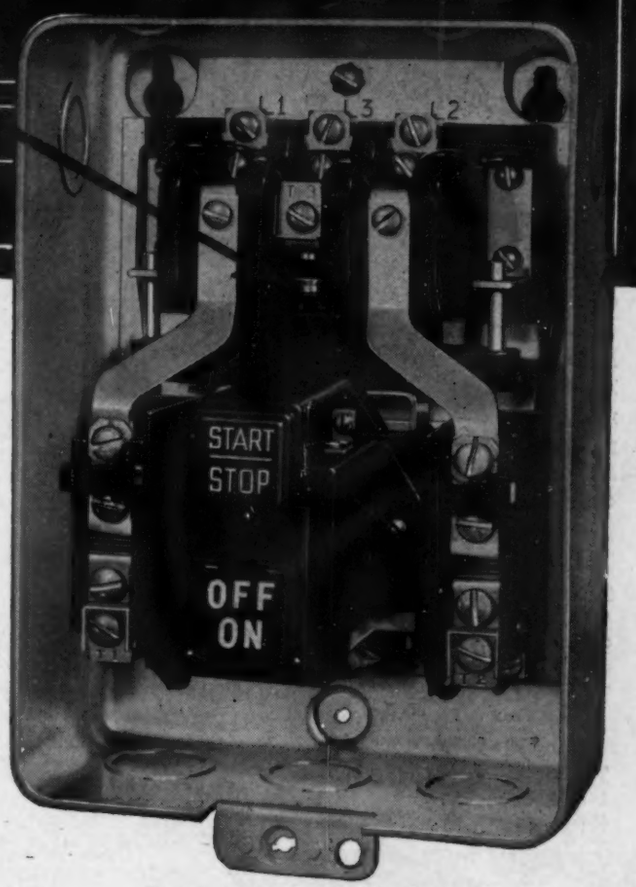

Form A Starter with integral (Single) push button. Cover removed.

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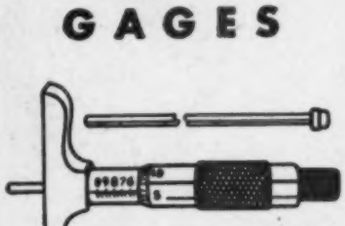

Designed for measuring holes, grooves, shoulders, etc., up to 3 inches in depth. Includes a set of interchangeable rods —1-inch, 2-inch and 3-inch, which are easily inserted and held to a positive seat by the knurled rod cap. There is an adjusting nut on each rod to compensate for wear.

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is well worth while from the cost point of view.

However, the real mechanic takes pride in the possession of a good kit of tools. It saves time going to stores every time he needs a tool, and he is more familiar with his own. The cost is very low when you consider that a good machinist's kit of tools and chest can be bought today for around $120. They will last a lifetime with care. This sum includes a 12-in. vernier, an indicator, a few squares, angle gage, depth gage, calipers and 1-, 2-, and 3-in. mikes. All other tools necessary for larger work can be obtained from the tool crib.

It has always been the custom in the engineering trade for a machinist to have his own tool chest and tools, like the plumber and the carpenter do. Then he can please himself in how he uses them.

I have no doubt that in cases where a fairly valuable tool belonging to an individual has been accidentally broken, no carelessness was involved, and it was reported correctly. The overwhelming majority of concerns would gladly recompense the owner. I know of quite a few instances where that has been done.

All says that if a "Big Shot" had a suit of clothes ruined accidentally in the shop, the company would come across. They would, but they would and do come across today in similar cases in which the lowly laborer, through no fault of his own, has personal losses in the plant. Today, more than at any other period in our time, concerns are strictly fair and often generous in similar circumstances.

Just imagine what would happen in any plant where all tools used are company owned and where all tools must be returned to tool stores at weekend. Monday, all employees had to go to stores to get all the tools they require to start work and leave a check or fill up a slip for each tool. You would have to enlarge the tool-store personnel, or the majority of the men would not be able actually to start work for probably an hour after they clocked in. Not only that; to save Bill from going to the tool store for a pair of calipers, or a mike, if his mate on the next machine had one from the store, he would borrow it. In fact, the borrowing would become general, with loss of time and also loss of tools, because they belong to the employer and not to workmen, who would take greater care of what was their own property.

In 50 years in the industry I have never heard any machinist suggest that the employer should supply the tools, other than cutting tools.

Arthur Silvester
Oakdale, Conn.

•

WHO HIRES 'EM?

Many industries today are working under union agreements; therefore, it is important to maintain a functional personnel department with hiring responsibilities.

If a personnel department is continually making poor selections for specific jobs in the shop, this does not necessarily mean that the organizational system is at fault. It does, however, indicate the need for an investigation regarding the capabilities of those staffing the personnel department.

Much effort has been made to have hiring handled from a purely scientific basis of rating scales, trade tests, mental tests, and so on. But these methods do not replace acquired intuitive judgment.

It is good management to select an employment manager carefully. Sometimes the proper candidate may be chosen from a select group of seasoned shop men. In such cases, a certain amount of grooming and guidance may be necessary. Coupled with understanding of shop traits, persons and job environments, such candidates are admirably fitted for this important job.

In most cases, a skillful employment manager will select and properly place the right person for the job, if job descriptions and classifications are carefully prepared. However, when the case involves the hiring of highly specialized tradesmen or key personnel, it is to the advantage of management to have the employment manager work jointly with the foremen or shop superintendent in order to make the correct choice.

Foremen today do not have the time to participate in the average hiring activities. Their job is to make good employees of the people furnished them and to rectify conditions if poor selections are made.

Peter L. Budwitz
New Britain, Conn.

•

People should, and a goodly portion do, place themselves in the line of work which interests them most. As a natural consequence, they locate in the service where they are most apt. Therefore, a personnel man engaged in the vocation for which he has a liking should be better qualified to

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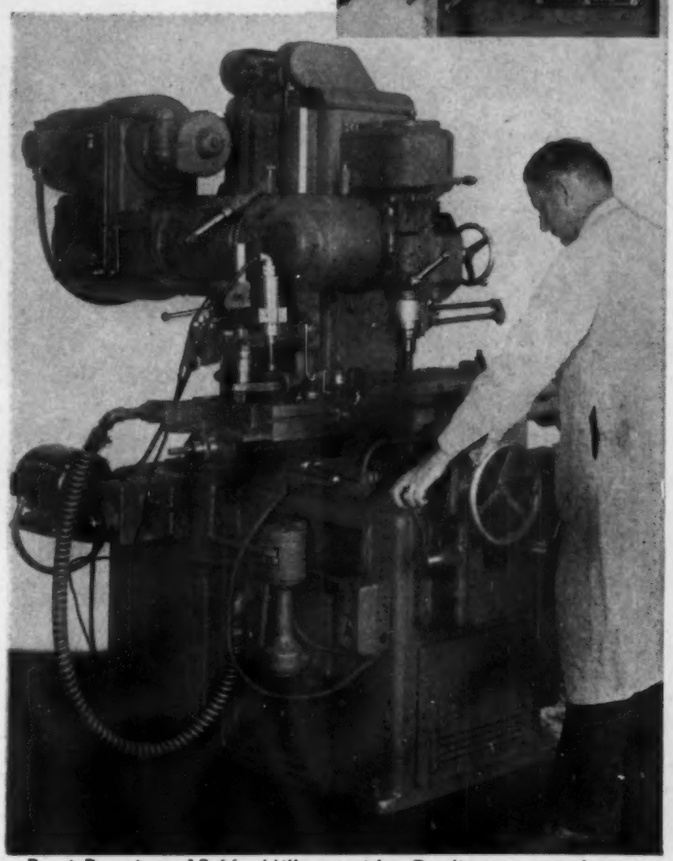

Reed-Prentice 12-V Miller, with Duplicator attachment. Upper view — control panel conveniently mounted on column.

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Infinite speeds . . . . 90 to 2200 RPM arranged for #40 NMTBA taper	
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select and hire capable men than a foreman whose main job is seeing that men do their particular jobs in a satisfactory manner.

The foreman under whom the newly employed man is to work should have a chance to recommend to the personnel man a man whom he thinks should be employed, but the personnel man is the logical man to make the decision.

Personnel work leads to more careful and clear understanding of human nature and its adaptation to the various fields of endeavor. Like all other kinds of service, personnel men have learned much, especially in recent days which have brought about so much competition.

John Mark May
Watervliet, N. Y.

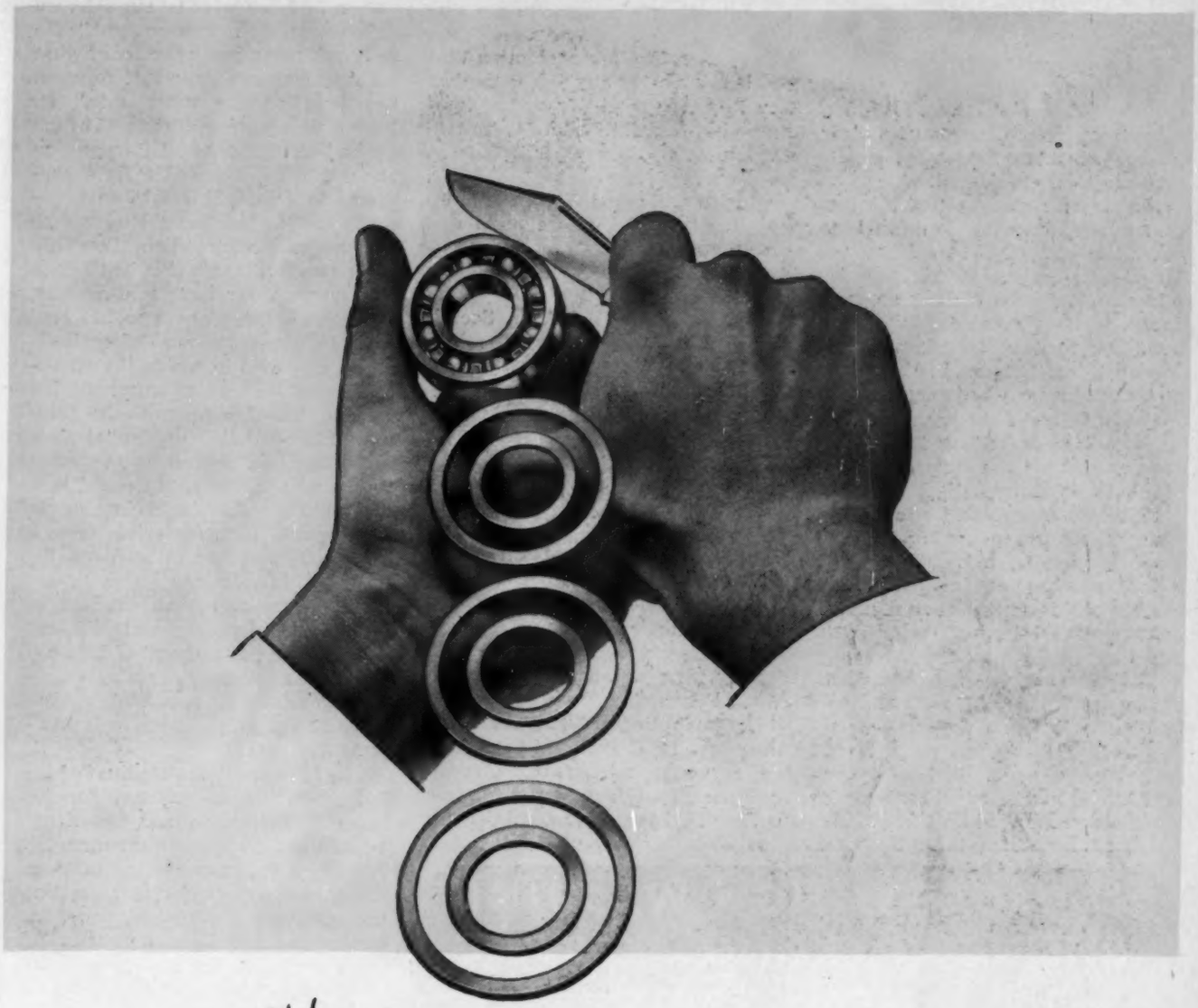
•

Personnel is, of course, directly charged with the placing of the best man for the job. Equally responsible, however, is the foreman or supervisor who supplies information on requirements of the position in question. Closest cooperation between these two departments is essential. Neither is in a position to handle, nor assume, entire responsibility.

It is the duty of the foreman requesting a man for a certain job to give Personnel all possible information concerning the position. Requirements should include the physical demands. If the work is light and the eye strain not too great, possibly an older man would be best fitted. If the position demands continuous and clocklike operation, a younger man would naturally be better suited. If the job requires a great deal of bending, a tall or stout person is out of the question.

Educational requirements are also important and should be clearly outlined. Even though a man has not been accustomed to doing the work in question, but something of similar or equal skill, he may have the educational background to enable him to learn quickly. Such a person often proves better than a dyed-in-the-wool individual who knows all the ropes—and knows what he can get away with. If the work requires good mechanical judgment, rather than a good education, possibly a middle-aged man with a number of years of experience would be better for the job.

A man's home life; where he lives; his character; his attitude and many other personal factors must also be given careful consideration. The foreman is in the best position to know just what points are most im-



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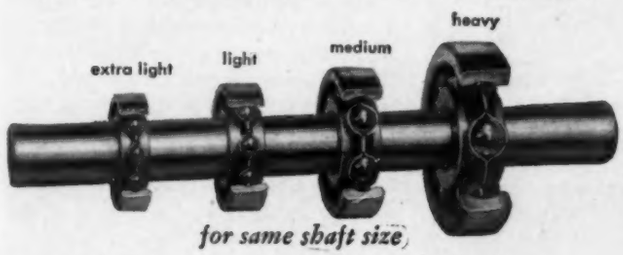

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portant and necessary successfully to fill the position.

It is not expected, nor even hoped, that any man living would fill all the desired qualifications. It does, however, give the Personnel a clear picture of many important points that must be considered.

Having this clear picture, it becomes the duty of Personnel to 'weed out' the applicants. Those selected as possible material for the position should be given an opportunity to be presented to the foreman, for further interview. While the applicant is fresh in the minds of both Personnel and foreman, the individual should be discussed and important points brought out. Neither can expect the best results unless both do their part.

Some men are better salesmen than others. Some are able to sell their services at a high price and yet do not have the ability to handle the position in question. Usually, their work records will bring out a number of hidden secrets, by merely putting two and two together. Other men are not good salesmen and will sometimes lose an opportunity because they lack the ability to tell what they can do. By having Personnel, as well as the foreman, cross-check an applicant, many important points will come to the surface.

It is therefore my contention that the best man for any job is neither hired by Personnel nor by the foreman—but by both. Where these two departments operate individually, and without regard to the other, confusion and dissatisfaction will invariably result. A disorganized and discontented group of employees, under such conditions, is a natural consequence.

A. F. Scoblic
Milwaukee, Wis.

TO THE EDITOR

ON WHICH SIDE ARE FOREMEN?

Two industrialists told the U. S. Senate Labor Committee recently that unionization of foremen destroyed their loyalty to management. They spoke as though their loyalty were an acknowledged fact. What they might have said is that if foremen became unionized that their loyalty, if such existed, would be seriously questioned. Clarence Bleichter, president of the Chrysler DeSoto Division, is quoted as saying, "When foremen were on our side, we suffered enough from output." He gave a rather gloomy picture of what management can expect if foremen "go over on the other side." H. Parker Sharp, general counsel of the Jones & Laughlin Steel Corporation claimed, "It is impossible for supervisors to remain loyal to management and at the same time please the workers with whom they are associated." It is said that he claimed that no man can serve two masters.

The statements above would lead us to believe that Free Enterprise is a battle ground in which the opposing forces are making a franctic bid for the aid of a neutral—the foreman. Let not Labor or Capital gloat in satisfaction that it is the other fellow who is the guilty one. There must be a sound housecleaning in both camps. Industry arises from a desire of one party to reap benefits from his investments by manufacturing a product with the aid of intelligent planning and efficient labor. If the management of industry doesn't use horse sense pretty soon—to be governed by sound intelligence—the future of free industry is problematical.

The foreman is the medium of intelligence. He is selected for his superior knowledge and experience as well as his ability to get the work out. He is the intermediary between those who are intent upon getting the greatest production with the minimum of dollars invested and those who are intent upon securing the greatest number of dollars for what they produce.

To speak of a foreman as being on one side or another savors too much of an acknowledgment of disharmony. When industry lets its representatives, the foremen, pull away from its fireside, it is sunk.

What has industry to offer the supervisors in order that it may justly merit the loyalty referred to by Mr. Sharp? Should management continue to reward them with a financial remuneration only slightly above that of the workman who goes about his tasks with comparative peace of mind? I am of the opinion that a foreman can serve three masters. He can serve management with unquestionable loyalty and efficiency; he can direct the men under him with confidence and satisfaction that they will show him the highest respect and cooperation, and he can maintain his well-earned self respect by serving himself with a clear conscience that he is master of his situation.

J. Homewood
Ontario, Calif.

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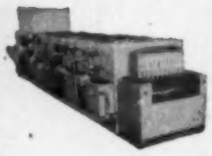

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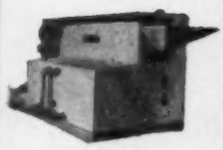
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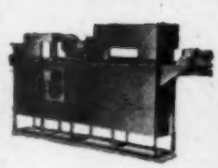

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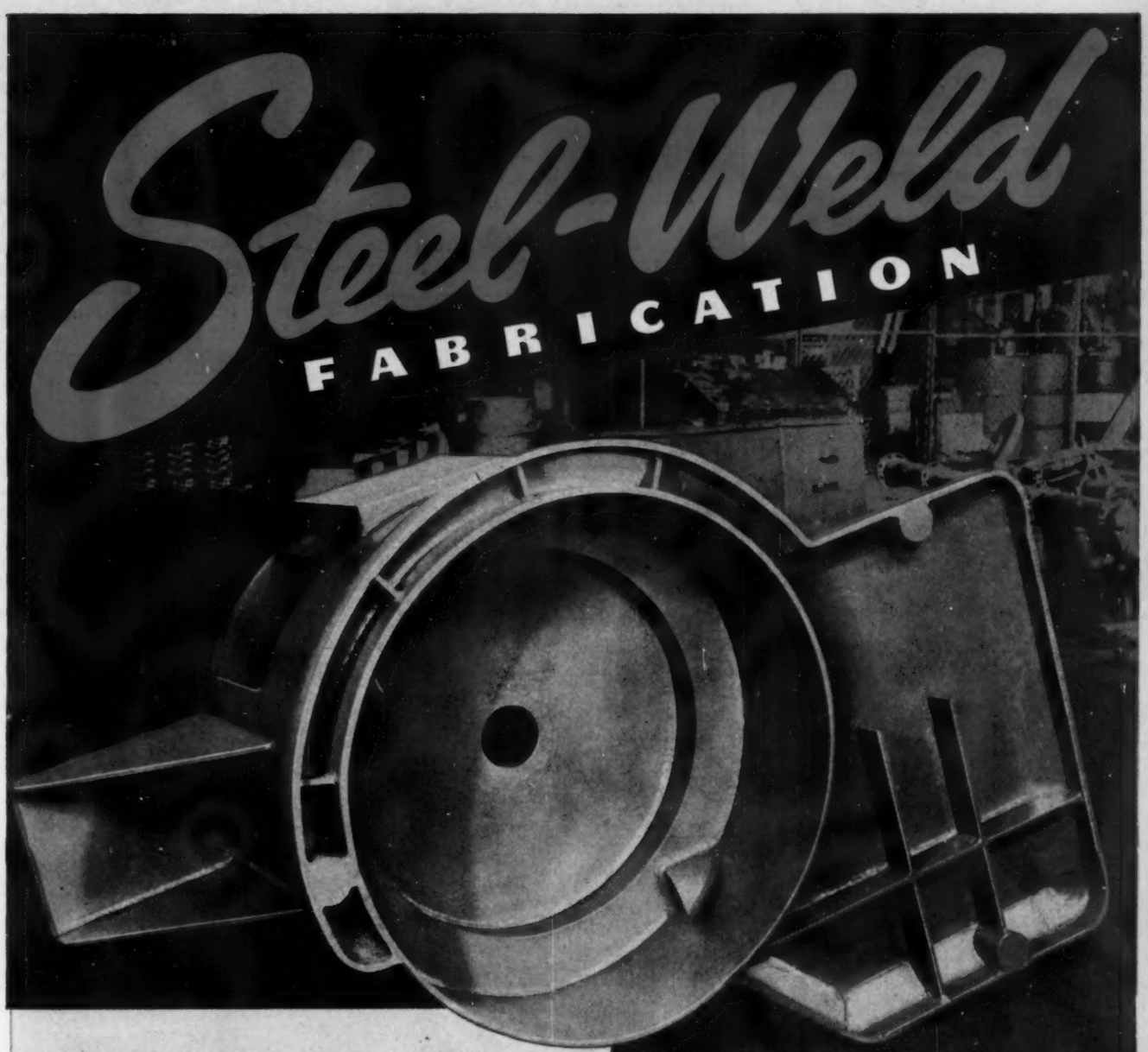

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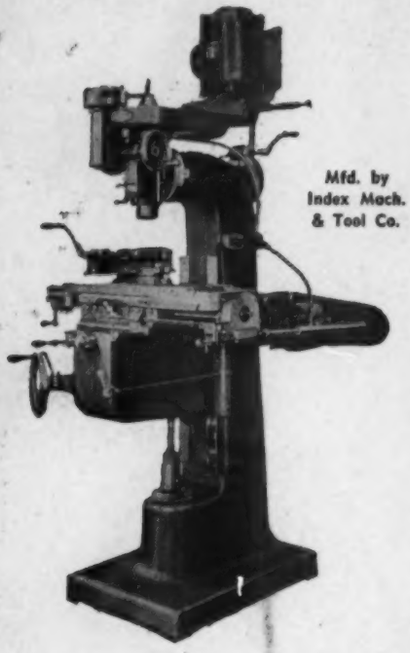

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NEW BOOKS

INDUSTRIALIZATION OF LATIN AMERICA—*Edited by Lloyd J. Hughlett. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. 517 pages. Price $5.*

Thirty business leaders from the United States and Latin America have combined in preparing this book. They have written authoritatively on the various business fields which they represent, and thus present an over-all picture of the present-day Latin American industrial system, from a practical point of view.

More than 120 photographs of industrial activities, maps, and graphic presentations afford a comprehensive review of manufacturing plants, public facilities and utilities, transportation, and recently developed natural resources.

Business men, exporters and leaders in all fields of industry and technology, who have a present or projected interest in dealing with Latin American countries, will gain a wealth of material from this book. It interprets and evaluates trade potentialities, analyzes economic trends affecting manufacturing activities, and attempts to anticipate the direction of future industrial developments.

One chapter is devoted specifically to the metalworking industries and has been prepared by J. Seward McCain and George Loinaz, director and member, respectively, of the Market Research Department, Business Publishers International Corp.

This chapter deals with the trend in exports from this and other countries to Latin America, and gives a clear picture of unprecedented expansion in Latin American metalworking industries.

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THE FOREMAN IN MANPOWER MANAGEMENT—*By Lillian M. Gilbreth and Alice Rice Cook. A unit of the McGraw-Hill Industrial Organization and Management Series. Published by McGraw-Hill Book Company, 330 West 42nd St., New York 18, N. Y. 199 pages, 5¾ x 8¾ in. Price $2.50.*

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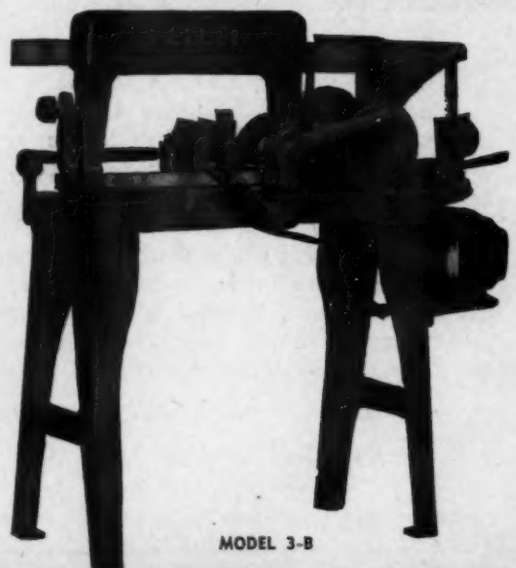

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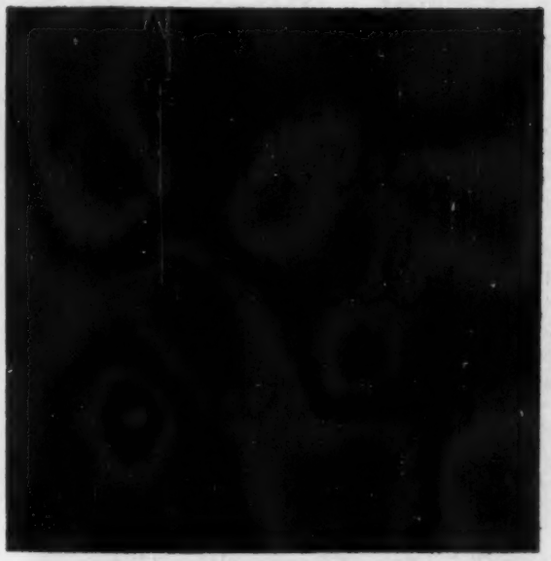

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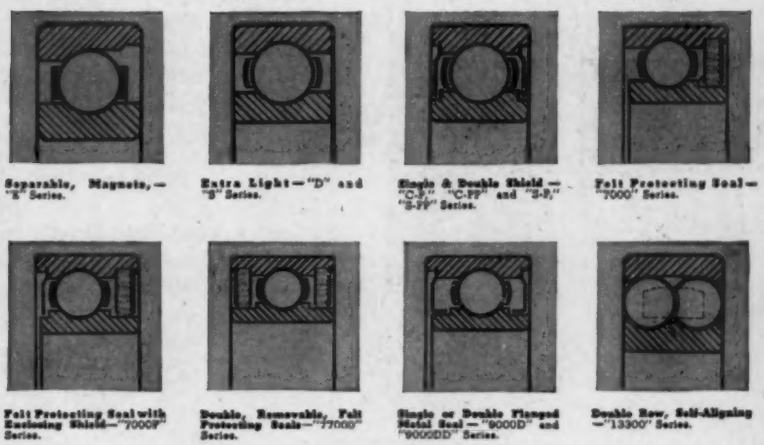
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Single or Double Flanged Metal Seal—"9000D" and "9000DD" Series.
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Above are eight examples of the complete line of *small size* (under 1" O.D.) Ball Bearings by Norma-Hoffmann. They come in both inch and metric sizes down to 3/8 inch O.D. They are precision made to Norma-Hoffmann's standard of absolute uniformity. Backed by 35 years of experience, Norma-Hoffmann offers you one of the world's most complete lines of anti-friction bearings.

NORMA-HOFFMANN
***Precision* BEARINGS**

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONNECTICUT
FIELD OFFICES: New York, Chicago, Cleveland, Detroit, Pittsburgh, Cincinnati, Los Angeles, San Francisco, Seattle, Phoenix

"YANKEE" VISES

Give *Start-to-finish* work holding

Off the swivel base, end down for accurate marking.

Back on the swivel base, at the bench, for center punching.

Lifted onto drill press, still accurately in position.

Held in same position but moved to milling machine.

Take a job through every step without a misstep . . . faster, easier . . . in a "Yankee" Vise. Work lined up accurately from bench to drill press, to milling machine and back to bench. Lifts off and on a swivel base at the bench. Vise squared on top, bottom, sides and front end for machine work. Easily made into handy, economical jig. Hardened steel block, V-grooved, provided with each "Yankee" Vise. Four sizes, with and without swivel base . . . 1½", 2", 2¾" and 4" jaw widths. Your industrial distributor carries the full line. **"Yankee" Tool Book FREE!**

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human factor and what can be in every phase of plant relationships to make the organization run more smoothly.

Five major parts include: The Basis for Manpower Control, The Employee as a New Worker, The Employee on the Job, The Employee as a Person, The Foreman as a Person. Each is subdivided into chapters which follow a logical pattern. Treatment is simple, honest and helpful, and reflects the modern concept of the worker as an individual entitled to individual consideration and treatment.

Included is information on expanding methods of production control into the management of men, hints for lightening daily tasks, ideas for building the morale and working conditions and equipment which in turn build production efficiency.

The book naturally suggests itself as "must" reading for all orders of management that must deal with people from selection to separation.

•

HEAT-TREATING ALUMINUM ALLOYS —*Published by Reynolds Metals Co., Dept. 47, 2500 S. Third St., Louisville 1, Ky. 144 pages. Price $1.*

A complete, detailed discussion of the subject is included in this wire-bound book. The first section contains a simplified non-technical summary of the metallurgy and heat-treatment of aluminum alloys.

Recommended treatments are outlined in tabular form followed by a detailed discussion for metallurgists and operating personnel. For each treatment there is a discussion of the difficulties that may be encountered and suggestions for their cure. A series of photomicrographs show normal and abnormal structures.

•

AUTOMOTIVE MECHANICS—*By William H. Crouse, Director of Field Service Educational Activities, Delco-Remy Div., General Motors Corp. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 673 pages. Price $4.50.*

This comprehensive book provides by far the best study of the subject thus far in a single book. Each subject is treated in a simple manner to make it clear to the student, yet it is not an elementary book. The material on each subject is detailed and up-to-date.

On each subject the theory of operation and construction of the mechanism is first covered, followed by possible troubles, their diagnosis and repair.

Following a brief discussion of the components of the automobile and the physical principles involved, there is a detailed discussion of the power plant including engine, fuel, lubrication, cooling and electrical systems. Power train, chassis and body follow, concluding with a chapter on shop practice and the use of tools.

In a field where most of the books have been rather unsatisfactory either because they dealt with only part of the subject or consisted primarily of a collection of independent descriptions from manufacturer's literature, this volume stands out for the obvious care which has gone into its preparation.

•

MANUAL FOR HEAT-TREATING SERVICES —*Published by Metal Treating Institute, 420 Lexington Ave., New York 17, N. Y. 68 pages. Price $4.*

To aid manufacturers in specifying their needs, this book discusses the range of heat-treating services. The discussion of steel selection includes the 8600 and 8700 series of NE steels.

Designed for the executive rather than as a working manual, the book discusses the relationship between heat-treatment and design, the basic principles of heat-treating, and gives a general description of the various treatments.

There is a chapter discussing the methods of ordering heat-treating and a metallurgical glossary.

•

MACHINE DESIGN—*By Louis J. Bradford, professor of machine design, Pennsylvania State College, and Paul B. Eaton, professor of mechanical engineering, Lafayette College. Fifth edition. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 283 pages. Price $3.25.*

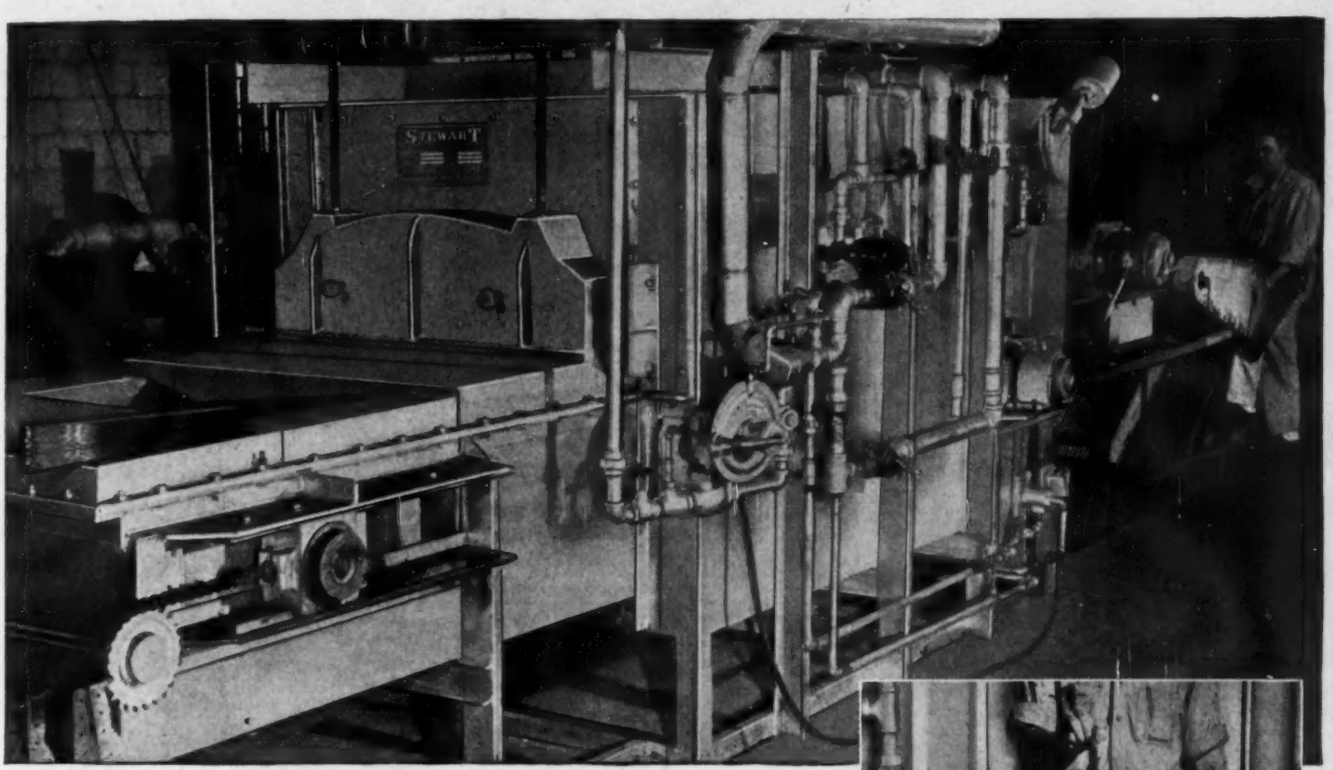
Additional material included in the new edition of this book includes primarily data on the fatigue metals, current theories on the nature of friction and lubrication, and special precautions necessary in designing parts made with aluminum. Obsolete material has been deleted and progress made during the past six years has been reviewed.

After a preliminary discussion of terms and the basic considerations of machine design, the book devotes a chapter to each of the principal machine elements (such as bearings,

No. 74 of a Series of Typical Installations

Sunbeam
STEWART
THE BEST INDUSTRIAL FURNACES MADE

For HEAT TREATING JUNGLE KNIVES
at CHARLES B. BRIDDELL, INC., CRISFIELD, MARYLAND

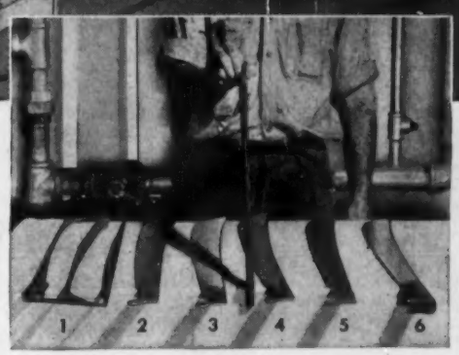


Over-all view of the gas-fired Sunbeam Stewart Conveyor Hearth Hardening Furnace in use at Briddell, Inc. for heat treating jungle knives. This installation was arranged to handle a capacity of 450 lbs. of stampings per hour.

Briddell engineers recognized two "musts" in the heat treating of their jungle knives. The treatment must prevent distortion of the stamping and, at the same time, obtain a hardness and toughness to withstand hard usage. Because of these high physicals—and the general shape of a machete—Briddell anticipated trouble. To meet these exacting requirements, Sunbeam Stewart designed a furnace and conveyor set-up. So successful has the recently installed gas-fired Sunbeam Stewart Conveyor Hearth Hardening Furnace been, that mass production of these jungle knives has become a normal operation.

This installation is equipped with an alloy conveyor belt. Blades are conveyed flatwise and are automatically discharged through a flap-type door into the quench tank. This set-up reduces to a minimum the time needed in transferring the knives from the hardening furnace to the quench. 450 lbs. of stampings an hour are handled in the Sunbeam Stewart unit. The working chamber of the furnace is 10" high x 36" wide x 5' 6" long.

This unit is typical of the industrial furnaces Sunbeam Stewart engineers are building every day to meet the specified requirements of manufacturers all over the continent. In addition, Sunbeam Stewart builds a full line of standard furnaces.



The small amount of distortion allowable in the manufacture of jungle knives—or machetes—is shown above. Typical dimensions of a machete are 28½" long, 2½" at its widest, and less than ⅛" thick. Briddell's combination Sunbeam Stewart Furnace and conveyor unit and quench has successfully overcome what was anticipated to be a bottleneck in their production.

Illustration shows: 1, Blanked out strip from which two machetes have been stamped; 2, The stamping; 3, First stage of cutting edge ground before heat treating; 4, Second strip, ground grinding, and trimmed before heat treating; 5, After heat treating; 6, Finished machete.

SUNBEAM STEWART INDUSTRIAL FURNACE DIVISION of SUNBEAM CORPORATION
(*Formerly* CHICAGO FLEXIBLE SHAFT CO.)

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Canada Factory: 321 Weston Rd., So., Toronto 9

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shafts, gears). In each case there is a basic discussion of the machine element, then detailed data on design, concluding with a group of practical problems.

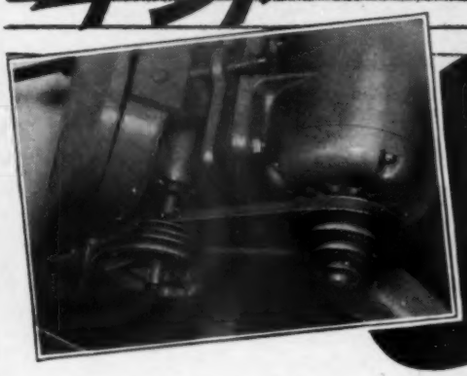
Short-cut formulas and graphical methods are avoided in order to emphasize fundamental principles. A working knowledge of kinematics and mechanics is required as a preliminary to understanding the text

•

STRESS CORROSION CRACKING OF MILD STEEL—*By James T. Waber and Hugh J. MacDonald. Published by Corrosion Publishing Company, 1131 Wolfendale St., Pittsburgh 12, Pa. 100 pages. Price $2.00.*

Substantial information on the stress corrosion of steel has been assembled in the last 30 years, but well-constructed theories and data have remained uncorrelated. In this monograph, a general theory of stress corrosion is presented and the importance of nitrogen was deduced from it. Many other elements compete with iron for the nitrogen and the authors proposed the "free nitrogen factor" to relate them quantitatively, and considerable evidence is presented to vary this mechanism.

A Speed Drive
a Feature of the
Kalamazoo
Metal Cutting
BAND SAW



You can cut tubes, solids, hard or soft materials on the Kalamazoo Metal Cutting Band Saw. Speed changes are quickly made by slipping belt from one position to another on the step pulley. Hinged motor mount tilts back for instant belt adjustment.

Four different speeds available—so practically every cut-off job in your plant can be handled accurately and fast—including many now being done on high priced equipment.

Ask your dealer or write direct for complete information.

MACHINE TOOL DIVISION
Kalamazoo Tank & Silo Co., Kalamazoo, Michigan
In Canada—BRIDGE MACHINERY CO., *Montreal*

Kalamazoo *Metal Cutting* Band Saw

a New Idea in A.C. and D.C. Switching Relays

Using a magnetic actuator with one or more self-contained contact mechanisms of the quick-make and break type

Class 7001 D.C. and Class 8501 A.C. Type P Relays have magnetic actuators and contact mechanisms of similar design.

APPLICATION • Switching relays are used to set up complicated control circuits, pilot larger magnetic devices, energize lights or audible signals, isolate low voltage circuits and occasionally to control very small motors having integral overload protection. They must be compact, inexpensive, fast, dependable, easily installed, and have comparatively low magnet coil demand.

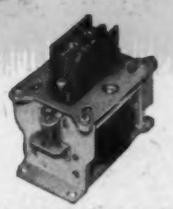
SQUARE D's DESIGN meets those specifications. It is mounted and wired from the front, requires no extra space for electrical or mechanical clearances; consists of standard parts; has short stroke and straight line action; utilizes one, two or three individually-enclosed snap-action contacts of double-throw construction; can be readily converted to meet job requirements; and comes with either A.C. or D.C. magnetic actuators of similar design.

Flexibility is a characteristic of growing importance in the field of automatic control. Use of an A.C. or D.C. magnetic actuator of similar design with one, two or three self-contained contact mechanisms, each having one normally-open and one normally-closed contact, results in a switching relay to meet nearly all requirements. Actuators with only one contact mechanism (carried in stock) may be readily converted to additional poles by installation of either one or two additional standard contact mechanisms, also from stock. Contact mechanisms are easily and quickly renewed in the field with a minimum of expense.

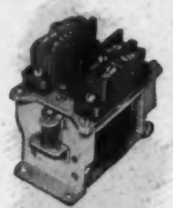
Write for complete details on Type P Switching Relays. Address SQUARE D CO., 4041 N. Richards St., Milwaukee 12, Wis.

CONTACT RATINGS

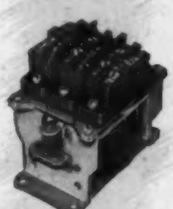
	A.C. Voltage				D.C. Voltage		
Electrical Ratings	110	220	440	550	115	230	550
Normal Amperes	15	10	6	5	2	0.5	0.1
Inrush Amperes	40	20	10	8	...	...	...



1 Pole, Double throw, D.C. Class 7001 Type PO-1



2 Pole, Double throw, D.C. Class 7001 Type PO-2



3 Pole, Double throw, D.C. Class 7001 Type PO-3

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Laundering tire moulds with brushes

saves money ...improves product

EVERY tire mold, regardless of size, must be thoroughly cleaned after each vulcanizing operation. Typical of the many modern production practices pioneered by The Firestone Tire & Rubber Company is the cleaning of watch-case tire molds with Osborn wire brushing wheels. Any other method would call for removing the molds from the press and installing replacements to insure continuous production. This additional handling plus inventory of substitute molds would all add up to a costly operation.

With the use of Osborn wire brushing wheels, all tire molds at Firestone are cleaned thoroughly right on the press in a matter of minutes. Valuable time is saved, need for additional molds is eliminated and the brushing technique conditions the metal surface for longer mold life. The end product benefits, too, as tires produced from molds that are power brush cleaned have a smoother, glossier surface.

This is a typical example of how Osborn brushes are used on many major production operations as a means of saving time, cutting costs and improving product. How can you be sure of obtaining these same brushing benefits? Avail yourself of the services of an Osborn sales engineer. He has the experience and the complete line of product to solve your problem.

Osborn Brushes

THE OSBORN MANUFACTURING COMPANY

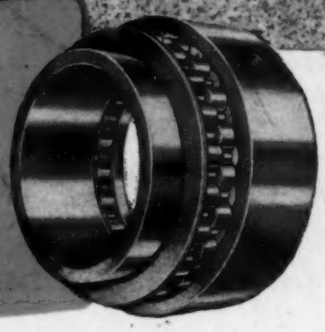
5401 Hamilton Avenue *Cleveland, Ohio*

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

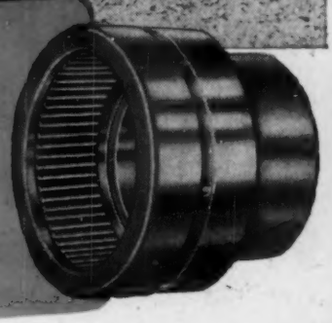
Today's High Speed Excavating Calls for *Bearings That Stand Up!*

Capable of making as many as five digging cycles a minute the ⅜-yd. Bucyrus-Erie 10-B is really a fast shovel, and one that stands up to tough digging, too. Widespread use of roller bushings and bearings is essential to both speed and ruggedness.

ORANGE "STAGGERED" ROLLER BEARINGS



ORANGE ROLLER BUSHINGS



Orange "Staggered" Roller Bearings have worked on 10-B drum shafts along with the Orange Roller Bushings. They combine extreme ruggedness with smooth, precision operation. The "staggered" roller arrangement distributes the load over many short rolls instead of a few full-length rolls as in conventional types. This assures an even running bearing of greater load carrying capacity. Full range of standard sizes interchangeable with other solid race type bearings.

Drum and transmission shafts of the Bucyrus-Erie 10-B have both been equipped with Orange Roller Bushings, whose internal clearances greatly reduce possibility of mis-aligned rollers—provide smoother, quieter running. Exceptionally high load-carrying capacity in small space permits compact design—provides ample overload margin. Orange Roller Bushings withstand severe stress and heavy loads with maximum life hours expectancy.

●INVESTIGATE the advantages of Orange Roller Bushings and Orange "Staggered" Roller Bearings. Write for Engineering Data Books showing design, sizes, capacities, installation data, etc.

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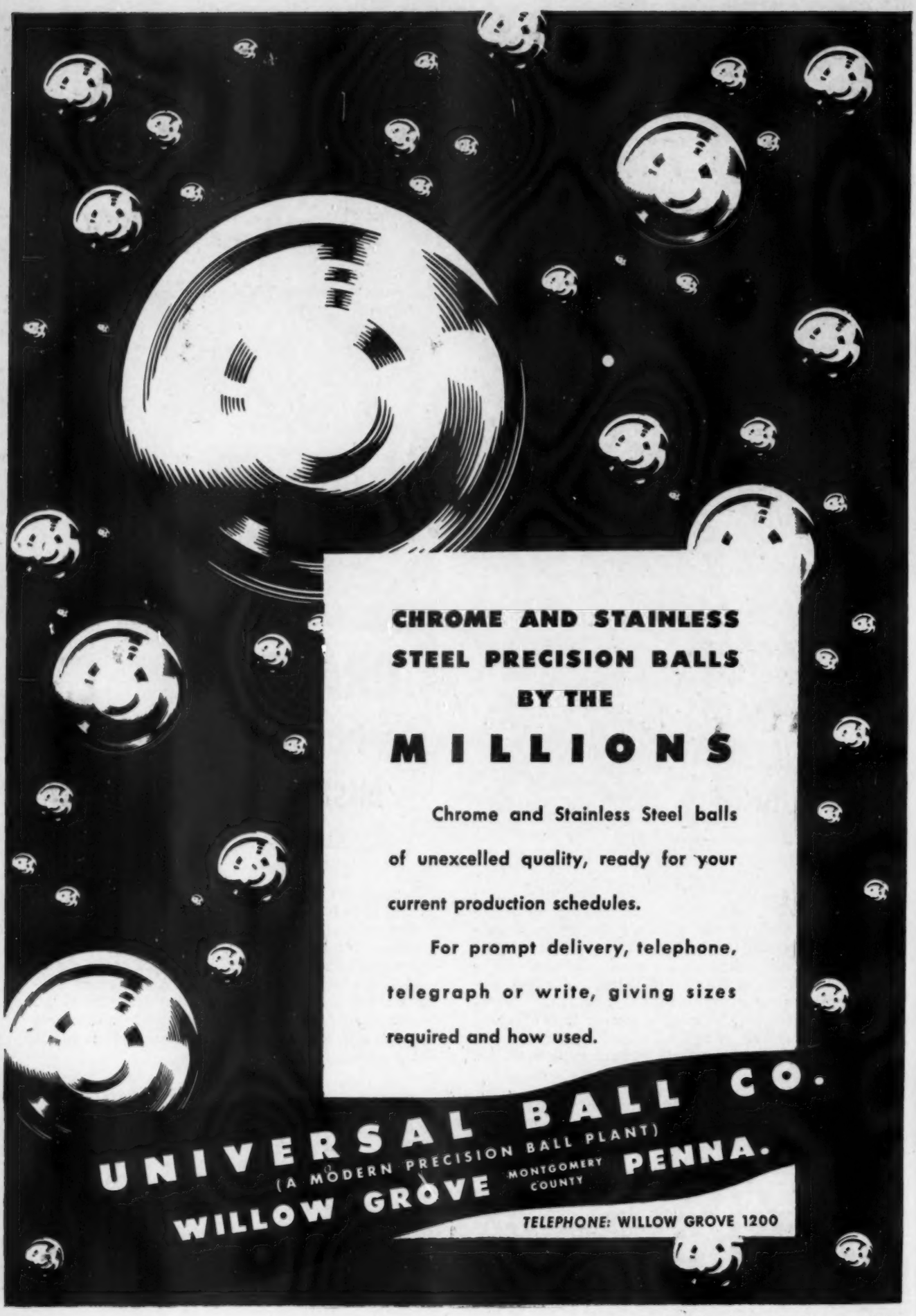
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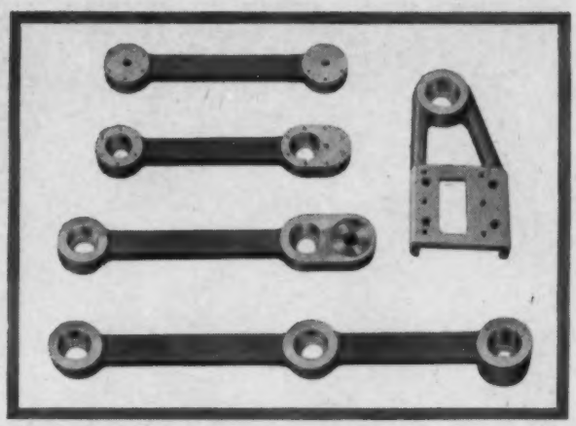
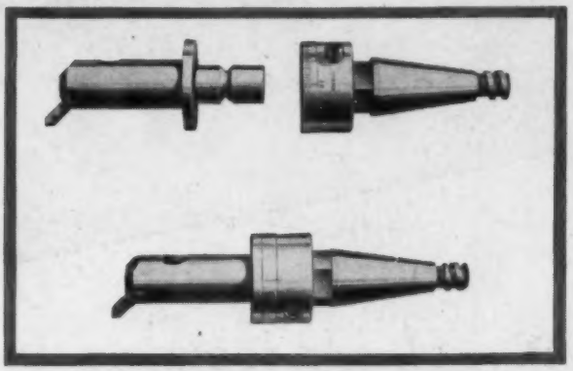
A CASE OF JIG-LESS PRODUCTION BY THE *Moore Jig Borer*

featuring the New "Eccentric Hole Sizer"



THE PARTS—Aluminum castings, requiring stock removal, hole location and hole sizing.



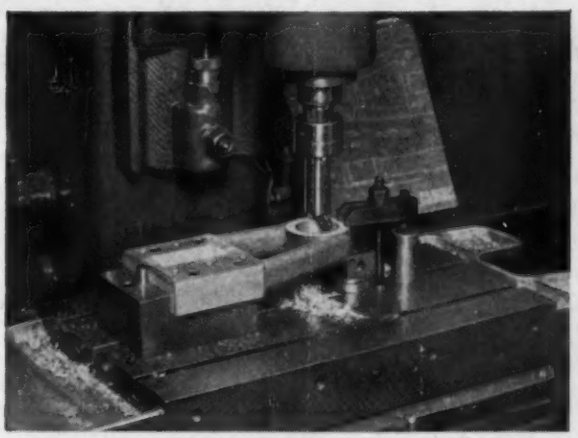
NEW MOORE ECCENTRIC HOLE SIZER (shown assembled and disassembled)—sets a carbide bit to .00005" (half-tenth) simply and easily. Taper shank allows tool changes in matter of seconds and will repeat hole diameters when single point sizing. Vernier setting of bar permits fine adjustment through a range of .004", plus conventional tool bit adjustment.

THE PROBLEM

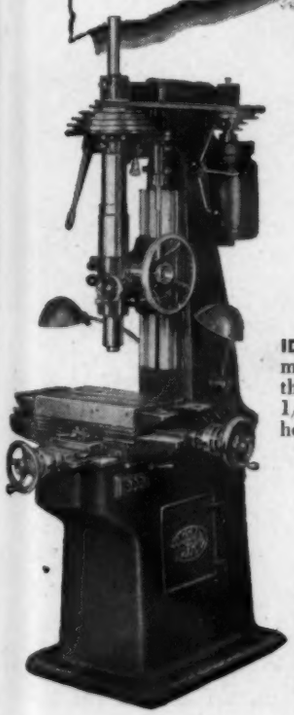
100 sets of parts yearly (see top photo), 25 sets per lot...holes approximately 2" in diameter.

THE SOLUTION

Produced in Moore Jig Borer at low cost because of minimum special tooling, to tolerances in "tenths," and in "Jig Time."



IN THE MOORE JIG BORER—Note simple fixture for holding work. This production problem can be handled with speed and dispatch because of the Moore Jig Borer's sensitive spindle, which provides speeds to 2,600 RPM, and quick-setting lead screws. The latter, ground to an accuracy of .0002" in 16", enables you to spot, drill, bore and ream holes in one set-up with minimum tool changes.



IDEALLY SUITED for jigs, fixtures, dies, machine parts and jig-less production, the Moore Jig Borer is sensitive for holes 1/32" in diameter and yet rugged for heavy cuts up to 4½".

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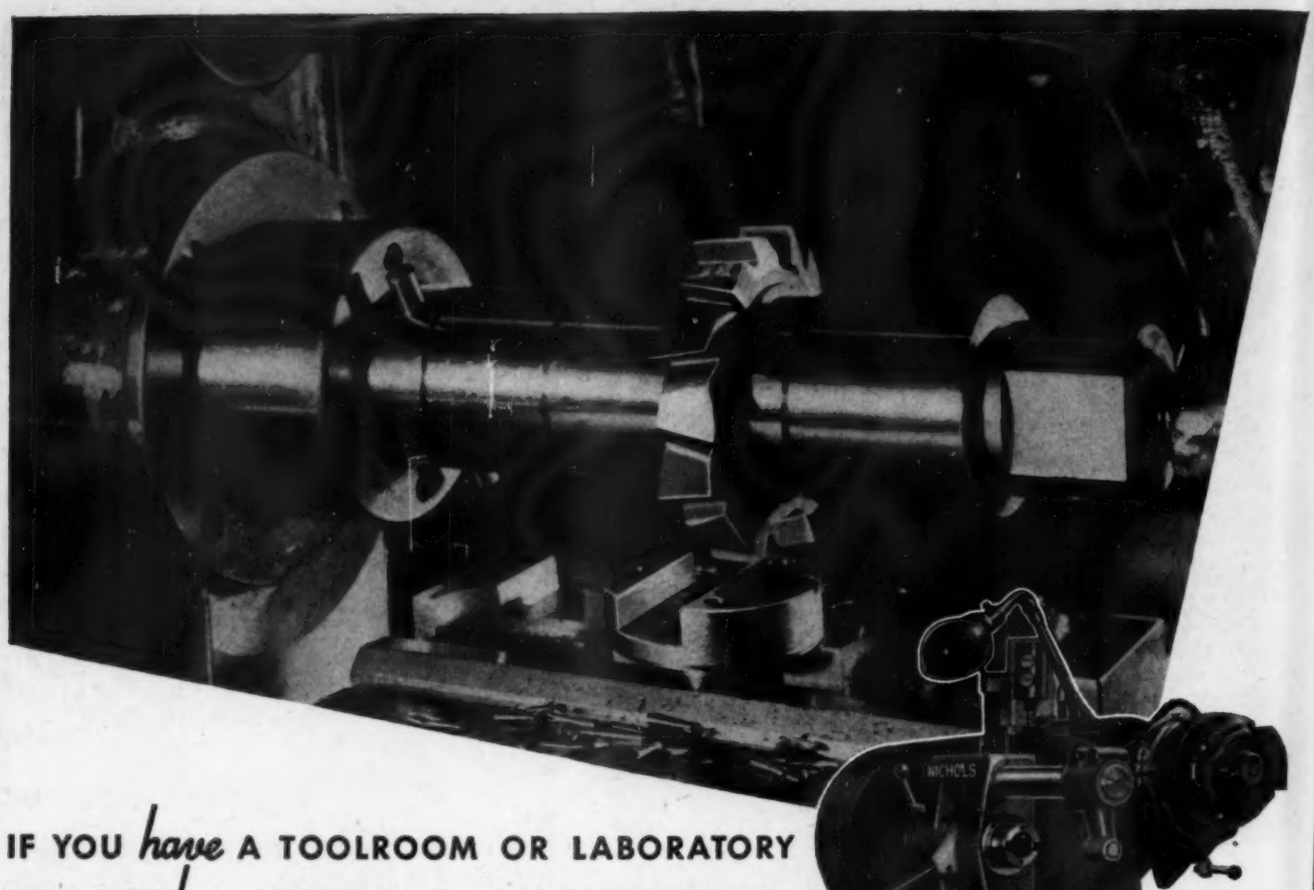
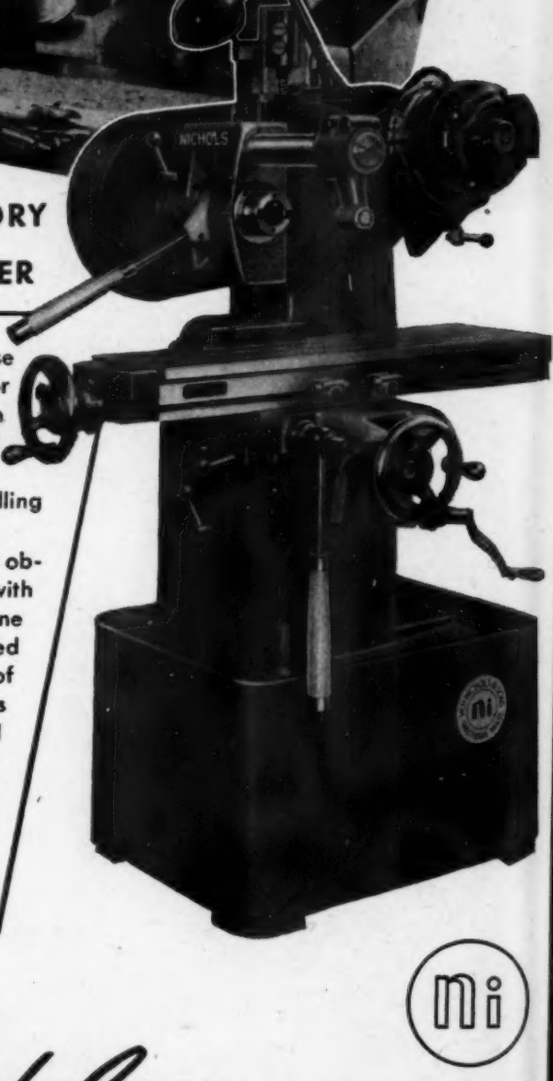
SPOTS, DRILLS, BORES, REAMS...WITH MINIMUM TOOL CHANGES





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Everybody who has a toolroom or laboratory can use a Nichols Toolroom Miller. And there's good reason—for the Nichols Miller, arranged for the toolroom, is more than just an ordinary milling machine. In addition to conventional milling, the Nichols can do grinding, turning, boring, and, by virtue of its unique rise-and-fall spindle, contour milling and broaching.

The extremely precise operation that you expect is easily obtainable on the Nichols Toolroom Model. Hand wheels, with large adjustable micrometer dials, provide for extremely fine longitudinal and transverse feeds. An extra large hand-scraped table (8" x 30"), with three T-slots, insures rigid set-up of long, light pieces requiring cuts up to 19" in length. These, plus the basic features included in all Nichols Millers—hardened and ground spindle mounted in preloaded bearings, heavy box-sectional knee with long, hand-scraped dovetail slides, accurate feed screws — combine to provide productive capacity that will meet the closest tolerances demanded in your toolroom or laboratory.

For more complete details on this versatile machine that "uses its head" to produce unusual forms accurately and with fine finish, send for the Nichols Miller Catalog.

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ALL-RESIN BONDING • ALL-DURABONDED COATING
ALL-FIBRE BACKING • ALL-OUT PERFORMANCE

To a veteran industrial disc user, the three improvements which distinguish the new Speed-wet Metalite Fibre Disc mean substantially increased grinding performance. All-resin bonding for instance, yields resistance to heat and loading. The all-fibre backing contributes spring-like flexural strength. The Durabonded* coating provides stamina and rugged grit anchorage. Taken all together, this three-fold improvement yields a disc of vastly improved cutting-speed, finishing properties and long life.

Field reports, wear-out tests and on-the-job comparisons all testify to the increased production performance of Speed-wet Metalite Fibre Discs. In fact, never before have so many people expressed so much praise for any disc we ever made. That's why we say, "Our best disc—and yours"!

Ask your Industrial Supply Distributor to furnish a test quantity of Speed-wet Metalite Fibre Discs next order.

** Reg. U. S. Pat. Off.*

BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.

"Drive Faster... set up solid, without burrs" says EVINRUDE

NO WOBBLY STARTS *and slow driving to avoid skids here. Phillips Screws go in fast, set up tight and flush to hold cover of water jacket.*

DRIVING TIME CUT 30% *in fastening base plate to muffler assembly with Phillips Screws. Power driver centers and stays in recess—no slips.* ▶

TIGHT FASTENING *is essential in joining the two parts of die cast fuel tank, so Evinrude depends on Phillips Screws. Photo shows use of Phillips Screws for attaching nameplate where skids would mean expensive refinishing.*

... Key points of another study of assembly-savings made with Phillips Screws in leading plants; from report of James O. Peck Co. independent investigator.

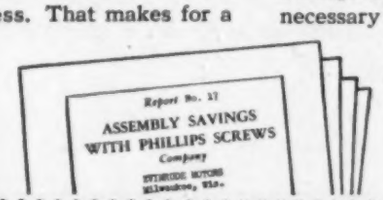
"Obvious assembly savings prompted our use of Phillips Head Screws in the 'Zephyr' Outboard Motor," explained Evinrude's Works Manager, "and results are even better than expected."

"Phillips Screws make the most of power tool speed. No lost motion as when driving slotted screws. We just bring the driver bit down and it automatically centers and seats in the Phillips Recess. That makes for a very fast operation... and an economical assembly. Also, we avoid driver skids, and subsequent expensive refinishing.

"We have to set 'em up solid, and the Phillips Recessed Head can take the necessary torque without breaking or burring. Outboards often get rough usage, and Phillips Screw fastenings match the sturdiness of the overall construction.

"Dangerous burrs avoided. Workmen can get bad cuts on hands and arms from sharp burrs common to slotted screws. With Phillips Screws, that hazard is banished, and the burr-free, ornamental recess has a much more shipshape appearance.

You'll find good ideas for your assembly operations in the complete report of this and other assembly studies... on metal, wood, and plastic products. Inside facts on modern methods of America's best assembly engineers. FREE—use coupon.



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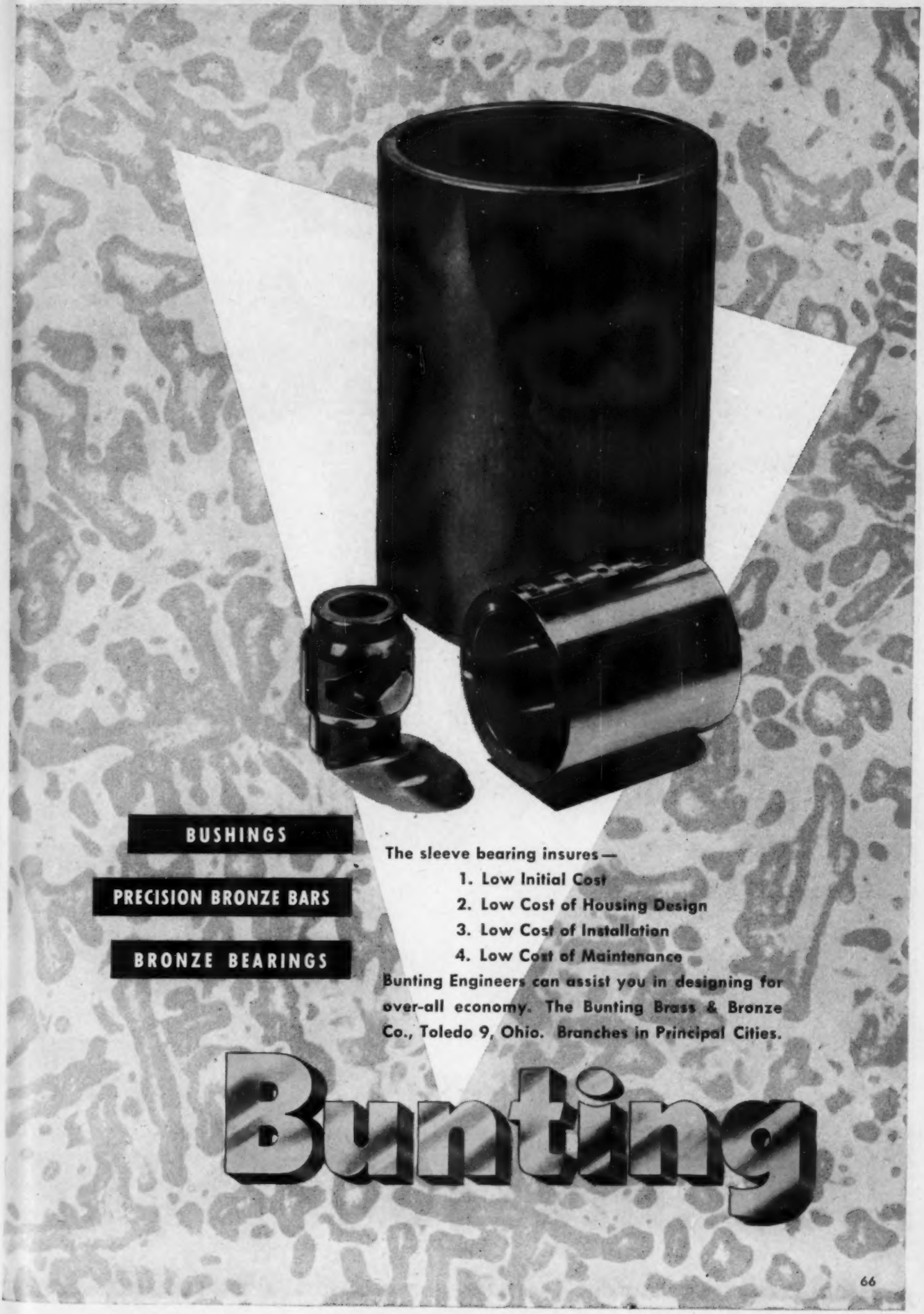
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The sleeve bearing insures—
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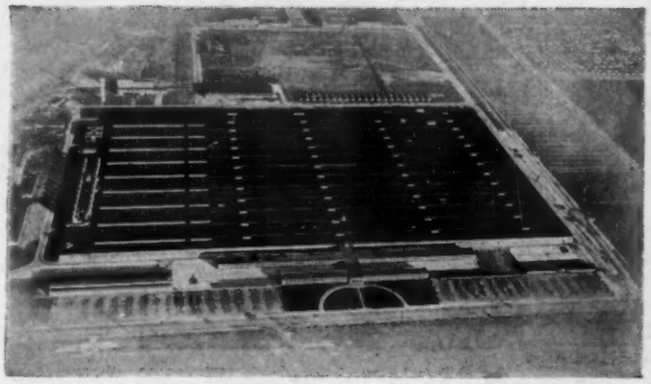
Make your plans now to be there. Attend the first Machine Tool Show that has been held in twelve years. There will be 12 acres of exhibits in the Dodge-Chicago Plant (now the Tucker Corporation Plant), where the engines for the B-29's were formerly made. It's the BIG show for the entire metalworking industry. Nowhere else in America is there sufficient floor space to display, under one roof, all of the exhibits of the 1947 Machine Tool Show.



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INDUSTRIAL LEADERS AND PLANT OPERATORS FROM ALL OVER THE WORLD

More than 100,000 management, production, engineering, purchasing and financial executives from all over the world are going to be there. You'll find the answers to some of your present and future problems at the Machine Tool Show. You can't afford to miss it.

TOOLS NEVER BEFORE EXHIBITED

The latest equipment and newest developments will be here, ready for your inspection. The products of over 250 manufacturers—more than 1,000 new machine tools, forging machines and other metalworking machinery and equipment, of all sizes and types, will be in full operation.

TECHNICAL DEVELOPMENTS AND FUTURES

In addition to the exhibits, the Machine Tool Congress will hold nightly sessions devoted to the presentation of papers, by recognized authorities, covering outstanding new developments in metalworking techniques and processes. All who attend the Show may attend the Congress. Your badge is your admission.

WRITE FOR COMPLETE INFORMATION

Make your plans now, to attend. Send in your advance registration today. If you have not already received your copy, ask for the booklet containing information about hotel reservations, transportation from downtown Chicago to the show, etc.

AVOID DELAY AT THE GATE

Send in an advance registration blank now. Your official registration will then be completed and mailed to you, and becomes your admission to the show.

MAIL YOUR ADVANCE REGISTRATION TO:

National Machine Tool Builders' Association
10525 Carnegie Avenue, Cleveland 6, Ohio

ADVANCE REGISTRATION

Name_____
(Please Print)

Title or Position_____

Company_____

Address (in full)_____

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The Registration Fee is $1.00. Checks should be made payable to the Machine Tool Show

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17
18
19
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Show Closed Sunday
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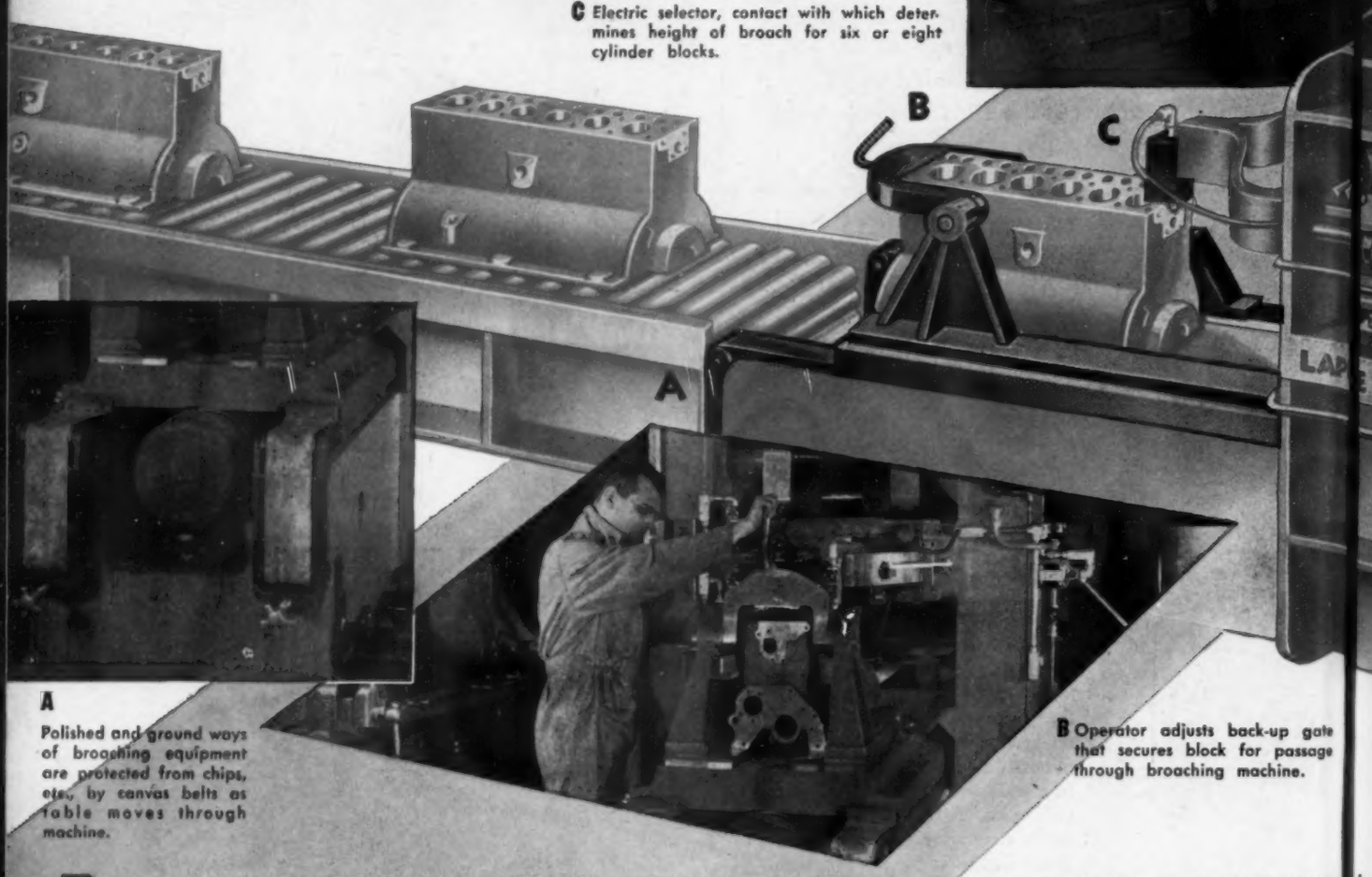
26

IN LINE WITH TOMORROW'S BETTER PRODUCTION!

The use of broaching means speedier, more economical production to meet the competitive demands of today's and tomorrow's markets. This method of metal removal is superior for both quantity and quality production, and keeps machining costs at rock bottom.

Broaching by Lapointe has meant savings of time, money and floor space in many instances. One of its most recent applications is in speeding the manufacture of motor cars. Investigate what broaching can mean to your future.

C Electric selector, contact with which determines height of broach for six or eight cylinder blocks.



A Polished and ground ways of broaching equipment are protected from chips, etc., by canvas belts as table moves through machine.

B Operator adjusts back-up gate that secures block for passage through broaching machine.

As motor blocks pass along the production line for various operations their surfaces become marred, requiring a further surfacing before final assembly. In the plant of one of the nation's leading motor car builders, producing both six and eight cylinder engines, both sizes move along the conveyor line together. Since the six cylinder blocks are approximately 3/16 of an inch higher than those of eight cylinders, it was always necessary to separate the sizes for surfacing. This involved cumbersome handling with resulting loss of time.

Lapointe engineers solved this problem by designing broaching equipment that forms an integral part of the production line as shown. This equipment enabled the broach to properly position itself to surface either height blocks as they came along the line.

As a block comes to the broaching unit or conveyor (A) it is put into position and backed up by a manually operated gate (B) and brought into contact with an electrical control (C) which actuates cams (E) that automatically adjusts the height of the broach (D) to properly surface the block passing

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF

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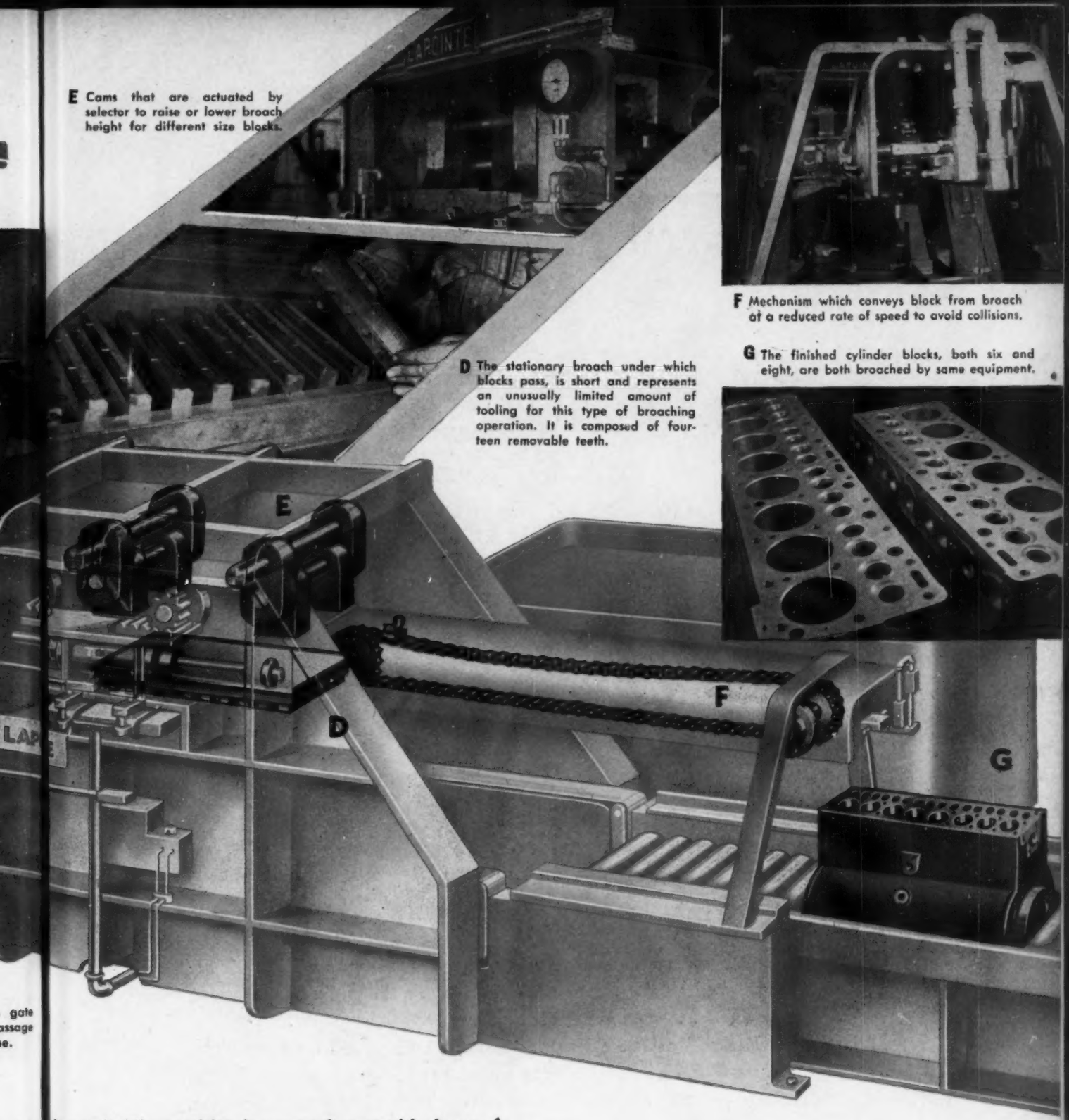

E Cams that are actuated by selector to raise or lower broach height for different size blocks.

D The stationary broach under which blocks pass, is short and represents an unusually limited amount of tooling for this type of broaching operation. It is composed of fourteen removable teeth.

F Mechanism which conveys block from broach at a reduced rate of speed to avoid collisions.

G The finished cylinder blocks, both six and eight, are both broached by same equipment.

beneath. The machine is a tunnel type with the work passing under the broach which remains laterally stationary. The block is pulled through the equipment hydraulically and upon emerging is engaged by an automatic conveyor (F), moving at a reduced speed. Its speed is sufficiently lower than the cutting speed of the broaching machine to prevent damaging collision with the block that preceded it. The block (G) slides gently into place in the belt that will take it to the next operation.

The broaching is done by a special tunnel type, 20 ton 72 inch stroke machine.

THE Lapointe MACHINE TOOL COMPANY

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BROACHES AND BROACHING MACHINES

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Unretouched photo of Tube Turns forging right off the press

Bookkeeper's pet

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Backed by A-1 die designing and die making facilities, every TUBE TURNS forging operation, from annealing to descaling, is geared to the top speed of TUBE TURNS' high-speed mechanical presses, and upsetters.

Time can be saved. And savings in forging production time mean important savings in money when jobs of the kind illustrated are needed in large quantities.

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Extreme care in every detail of production assures that Defiance Machines for boring, milling, drilling and tapping are soundly built . . . accurate to specifications of sound engineering. Backed by 97 years of precision manufacturing . . . built to help you *produce more*, with *greater accuracy* and *lower costs*. Defiance Machine Works, Inc., Defiance, Ohio.

Center Section Main Assembly

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Eight of these Defiance Machines in a series handle machining of valve holes and inserts in the manufacture of V-Type motors. A job demanding *accuracy* in a difficult set-up!

Turret Lathes and Screw Machines

DEFIANCE

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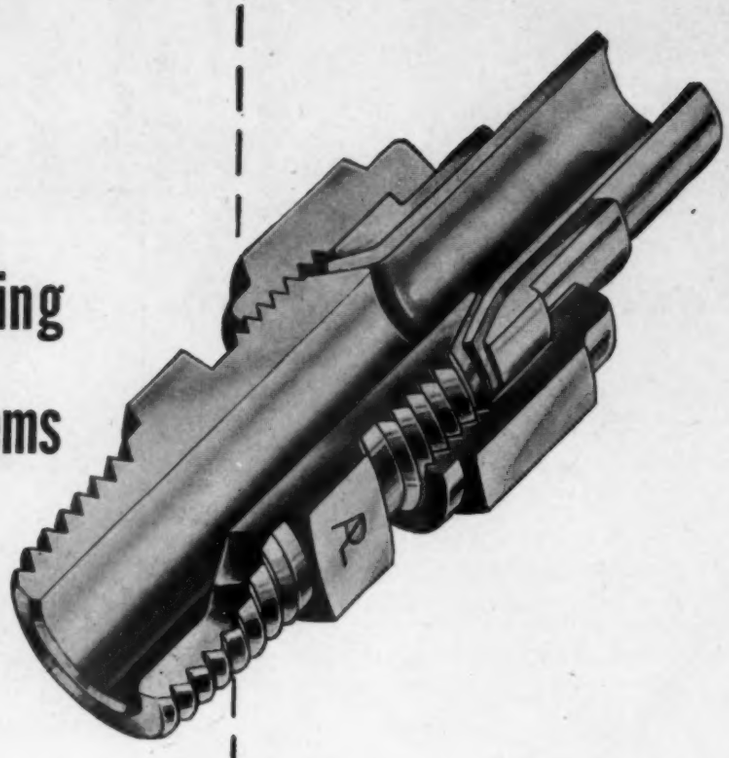
TAPPING MACHINES

This Parker Tube Fitting makes Free Flow systems possible



It takes *tubing* to achieve Free Flow. Tubing can be bent . . . can be connected without creating pockets that cause turbulence. Fewer fittings are required—resulting in fewer chances of leaks.

With PARKER Tube Fittings there's no threading on the tubing. You can use light or heavy tubing. Connections are pressure-tight—protected against leakage, vibration and shock—the result of **precision** manufacture.

With no threading on the job—installation and removal are quick and easy.

For simplified, Free Flow systems, use tubing with PARKER Fittings and Valves. And remember, *every* PARKER Fitting is a *coupling*.

Let PARKER work with you on your systems to carry liquids or gases, under high or low pressure.

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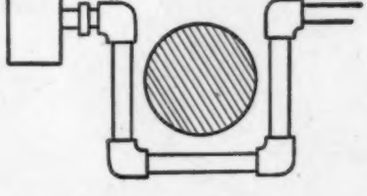
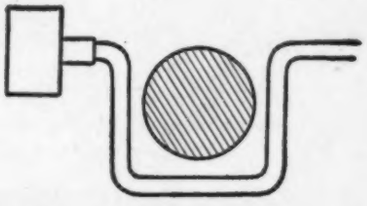
FREE FLOW— a comparison



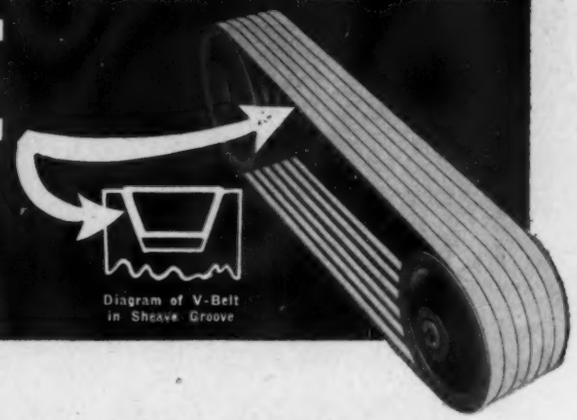
OLD METHOD—Each connection threaded—requires numerous fittings—system not flexible or easy to install and service. Connections not smooth inside—pockets obstruct flow.



MODERN METHOD—Bendable tubing needs fewer fittings—no "threading on the job"—system light and compact—easy to install or service—no internal pockets or obstructions to free flow.

Write for interesting booklet "Fluid Power".

ONLY the SIDE of a V-BELT *Grips the Pulley!*



—That's why the SIDE is what really *Gets the WEAR!*

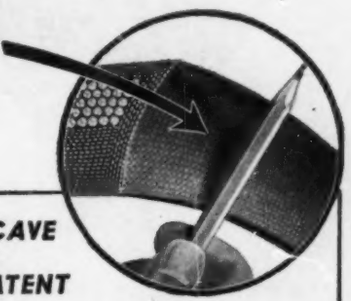
Look at a V-Belt in its sheave and you see at once that the *sides* of the belt do all the gripping on the pulley and get all the wear against the sheave-groove wall.

Notice, too—it's the *sides* that pick up all the power delivered by the driver pulley. The sides *transmit* that power to the *belt as a whole.*

And then, once more, its the sides—and the sides *alone*—that grip the driven pulley and *deliver* the power to it.

That is why you have always noticed that the sidewall of the ordinary V-Belt is the part that wears out first.

—*and here is how the* CONCAVE SIDE ★REDUCES Sidewall WEAR Giving You Much Longer Belt Life!



Clearly, since the sidewall is the part that wears out first, anything that prolongs the life of the sidewall will lengthen the life of the belt. The simple diagrams on the right show exactly why the ordinary, straight-sided V-Belt gets excessive wear along the *middle* of the sides. They show also why the Patented Concave Side greatly reduces sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

★*More Important NOW That STRONGER Tension Members are Used!*

Now that Gates *Specialized* Research has resulted in V-Belts having much stronger tension members—tension members of Rayon Cords and Flexible Steel Cables, among others—the sidewall of the belt is often called upon to transmit to the pulley much heavier loads. Naturally, with heavier loading on the sidewall the life-prolonging Concave Side is more important today that ever before!

THE GATES RUBBER COMPANY, DENVER, U. S. A.
"World's Largest Maker of V-Belts"

The CONCAVE SIDE is a GATES PATENT

Straight Sided V-Belt

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley.

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt.

476

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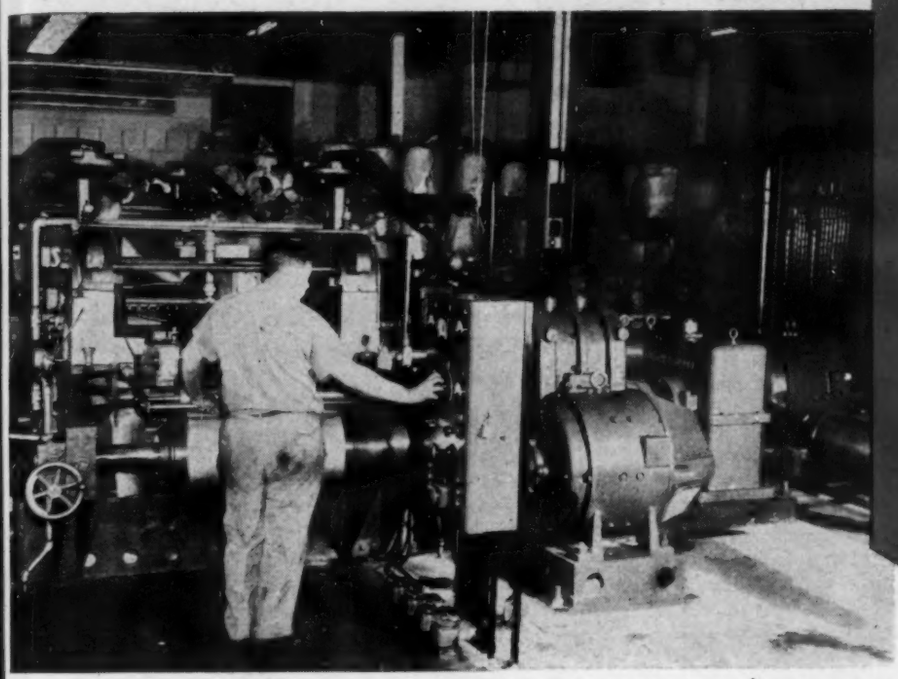
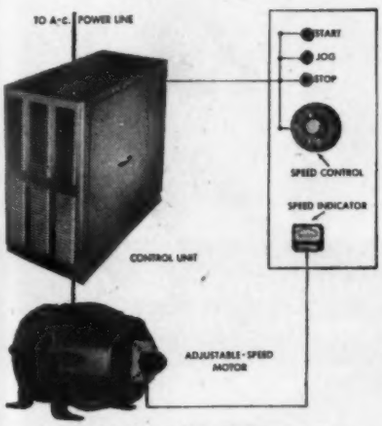


RELIANCE V★S DRIVE

RELIANCE V★S DRIVE



Conveniently-packaged, space-saving V★S Drives are available from 1 to 200 hp.

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Tell your supplier what you want. Let him select your blade or frame from the complete STAR performance-proved line. You'll have a faster, cleaner cutting; longer lasting blade; you'll have the right blade, a STAR BLADE!

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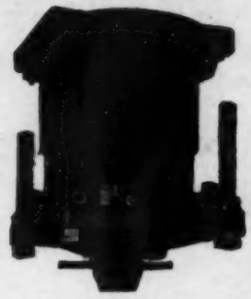
— REDUCED SETUP TIME
- DAYTON ROGERS DIE CUSHIONS



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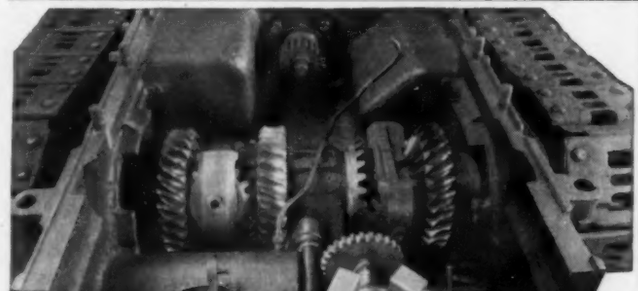

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Drive it clockwise. Drive it counter-clockwise. This Tuthill Automatic Reversing Pump delivers from the same port regardless of the direction in which it is driven. Without the use of check valves, it provides the dependable pumping equipment for use where drive shaft reverses (as illustrated) or where the ultimate direction of shaft rotation is not known. Ideal for lubrication, coolant and liquid transfer service. Capacities up to 200 g.p.m. in wide pressure ranges. Write for Tuthill Model R bulletin.

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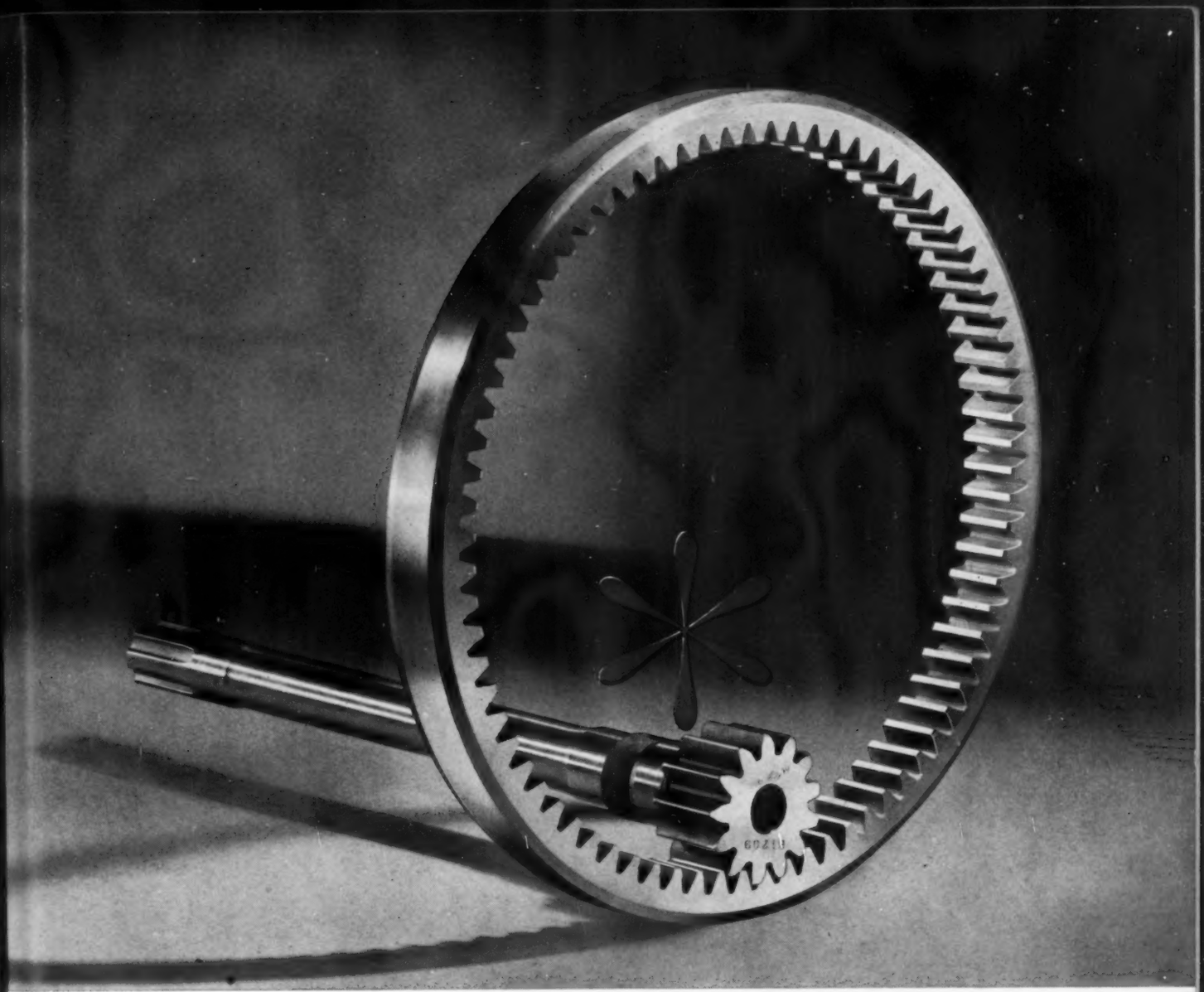

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THESE GEARS are made to be *forgotten*—forgotten by the buyer who puts them in his products, and by the ultimate user. The photograph shows some of the clean, bright sparkle of *rightness* in these gears—but it would take a thousand pictures to tell the full story of a set of "Double Diamonds."

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This is the BRONZOIL Bearing. Developed by Dodge for fan and blower service. A new and better transmission appliance.

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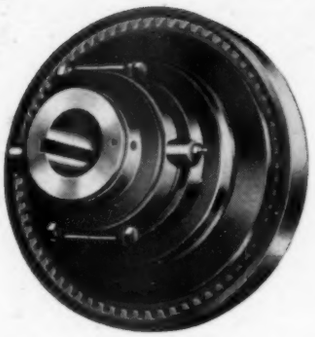

This is the ROLLING GRIP Clutch. Developed by Dodge. No toggles. A new and better transmission appliance.

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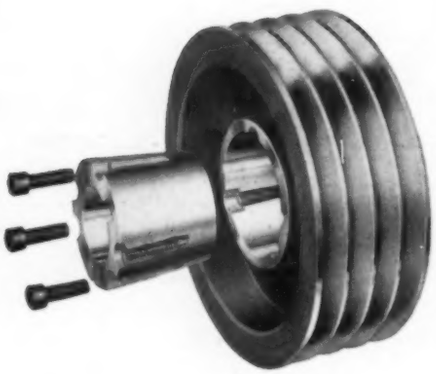

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This is the Dodge Transmissioneer – who will tell you about new ways of transmitting power mechanically.

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New equipment which helps cut costs, improve machine performance, increase production is offered to you by Dodge of Mishawaka. For detailed information about power transmission units to meet specific needs in your plant, or on your product, call the Transmissioneer, your local Dodge distributor. Look for his name in the classified telephone directory under "Power Transmission Equipment." A talk with him will prove profitable to you.

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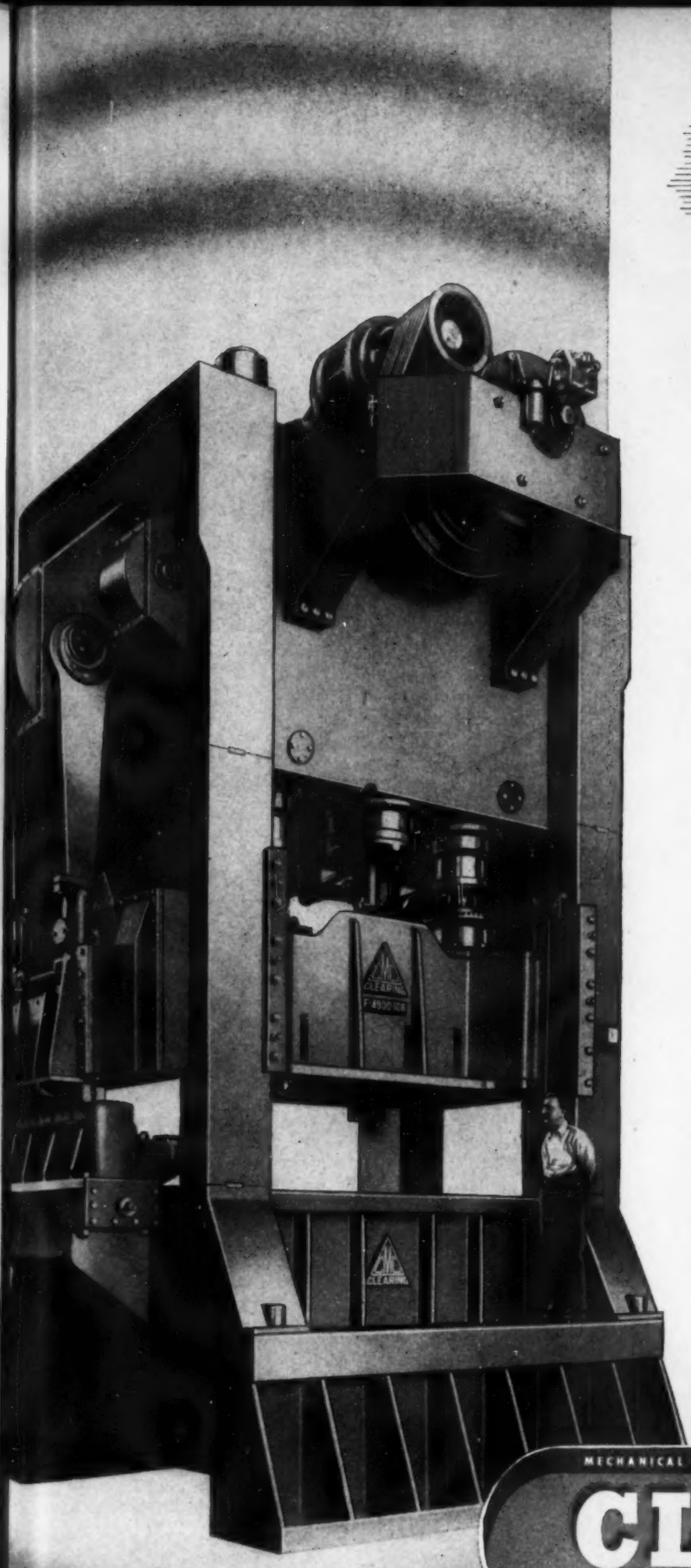

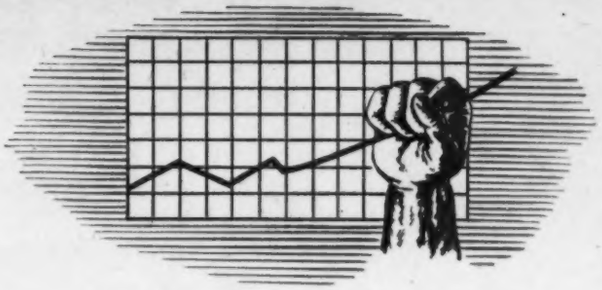

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Automatic feed, high speed production is not new or unusual in blanking operations—but when the blank is 27" in diameter and the stock is .90 carbon steel, 3/16" thick, it ceases to be an ordinary job. Clearing built this press to just those specifications, and the press is now delivering for its owner at 36 strokes per minute. Besides the blanking, the press cuts the scrap as it emerges, thus saving a separate operation and further reducing production costs.

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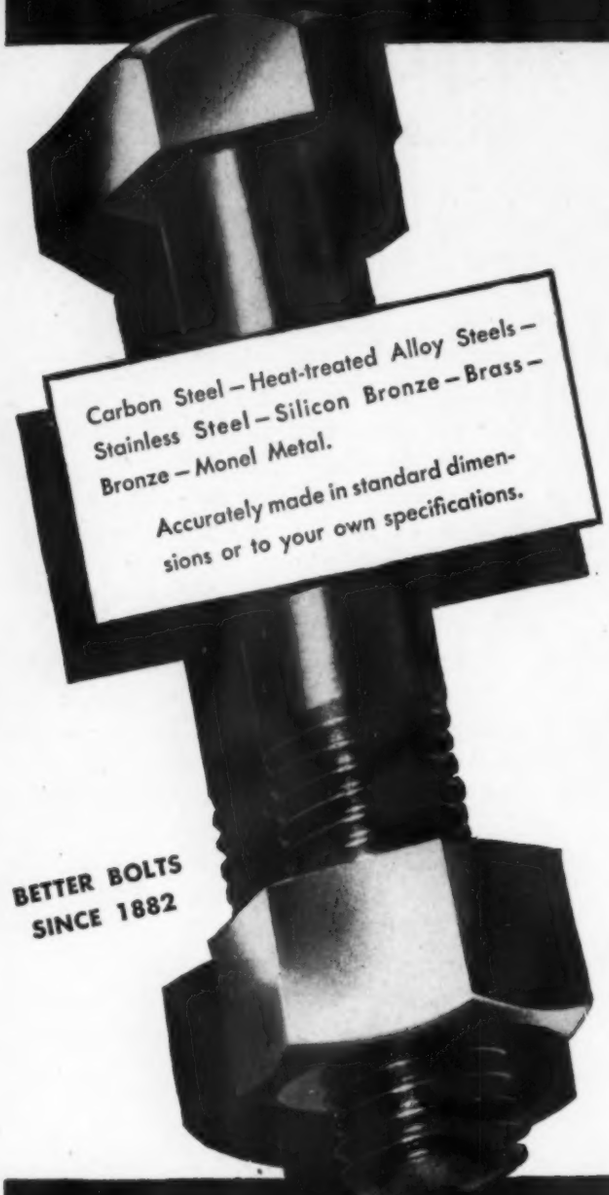

Carbon Steel – Heat-treated Alloy Steels – Stainless Steel – Silicon Bronze – Brass – Bronze – Monel Metal.

Accurately made in standard dimensions or to your own specifications.

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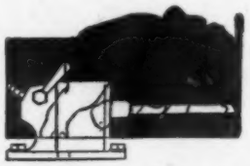
These new Mead Air Presses deliver 400 and 1200 lbs. pressure respectively on 100 PSI. Handle many staking, crimping, assembly, and similar operations. Clearances 4" and 7½" respectively. With foot control these presses will speed up countless bench jobs, save muscular effort. Write for new Air Power Catalog — just off the press.



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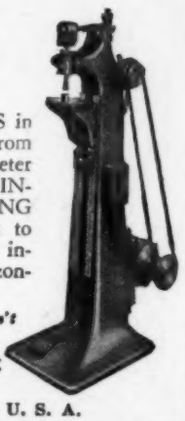
GRANT



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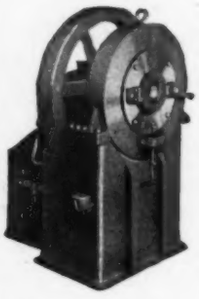

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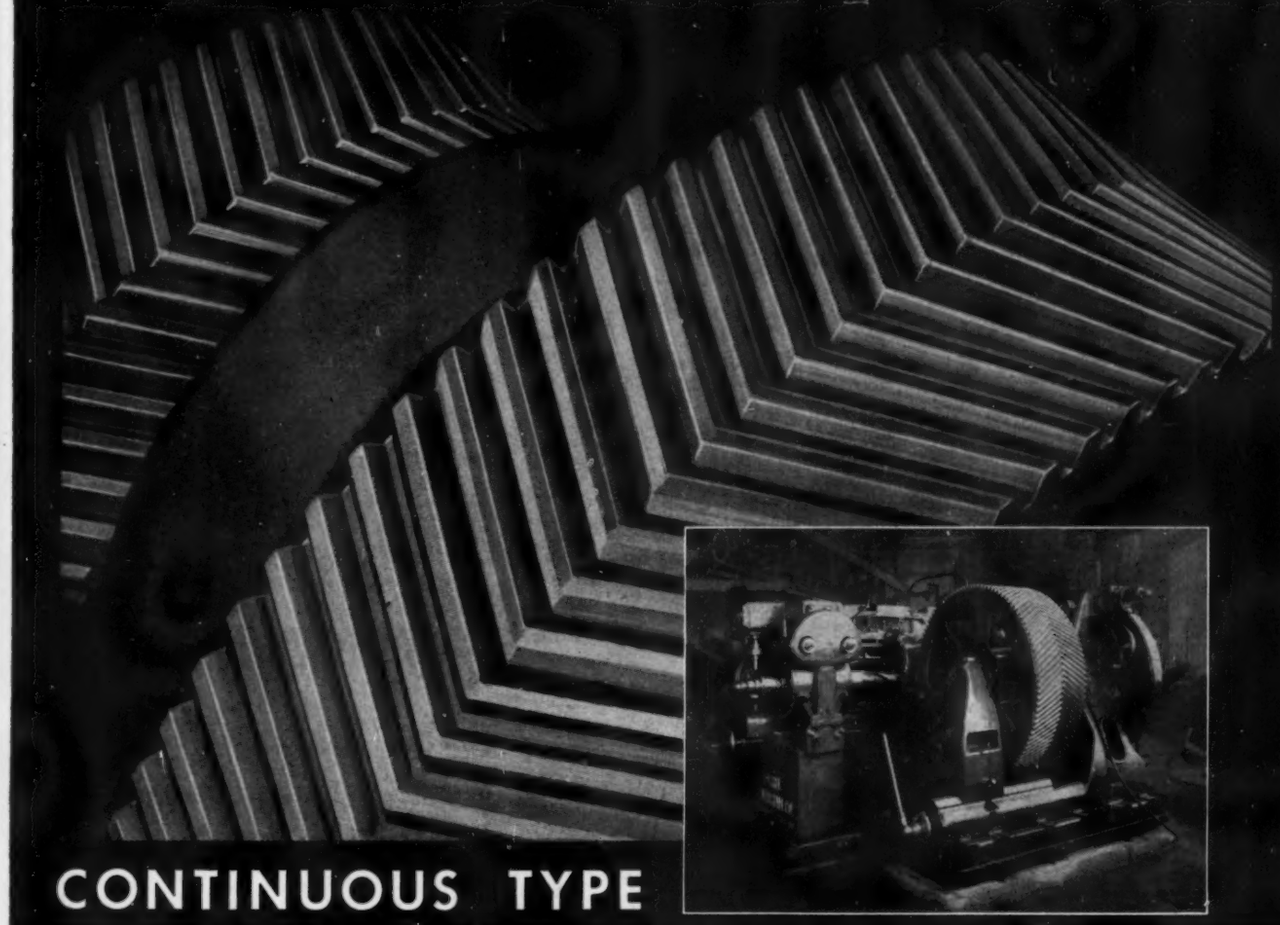
— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.

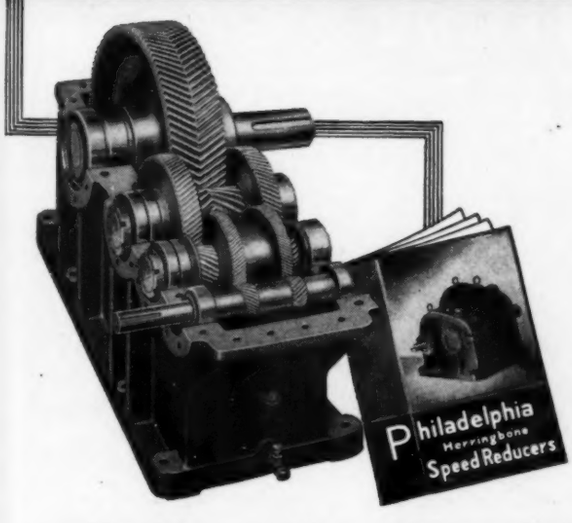
56 Field Street Torrington, Conn

HERRINGBONE GEARS



CONTINUOUS TYPE

One of a battery of Sykes Gear Cutting Machines in our huge shops. These can produce Continuous Tooth Herringbone Gears up to 60 inches diameter and 18-inch face, of any pitch or material.



Of course, we make all types of Herringbone Gears: *Sykes* (continuous tooth type); *Staggered Tooth*, and *Separated Tooth*. However, the *Sykes* (continuous tooth) type is generally favored, because it gives: (1) greater tooth strength (2) increased bearing surface (3) extra load-carrying capacity. The *Sykes* type is highly recommended for heavy duty drives, *where continuous service is required—where vibration and noise are objectionable—where very high efficiency of operation is desired—where great peripheral velocities are encountered—where high ratios of reduction must be obtained in a single gear train.*

Our equipment will produce Herringbone Gears up to 200" diameter, 48" face, and of any material.

Totally enclosed Herringbone Gear Speed Reducers are also made by us in Single, Double and Triple reductions. . . . Send for our Herringbone Reducer Catalog No. H-39—and, please use your Business Letterhead when writing for it.

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Industrial Gears and Speed Reducers
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IT'S JUST AS GOOD NOW

It's been a long time since January, 1909, when this ad announcing a new Earle plant first appeared on the front cover of American Machinist.

But, our original guarantee to "give you the kind of work you want" is just as good now as it was then.

It was with that guarantee that we first started supplying gears of all types and special machinery. It was because of that guarantee that we have enjoyed continuing success.

It's been good business to "give you the kind of work you want"—good business for us, and for you, our customers.

And it's on the basis of that guarantee that we continue to ask you to "write for estimates on your work."

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There's a good reason why PITTSBURGH Spur Gears give longer, trouble-free service. Engineering and production "know-how" plus scientific heat treatment are the answer. Furnished from 24 to 1¼ DP, with diameters from 1½" to 75"; face widths to 20". Inquiries invited.

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PIONEER PRODUCER OF QUALITY GEARS

VALVAIR Solenoid Valves "Work like Clockwork"

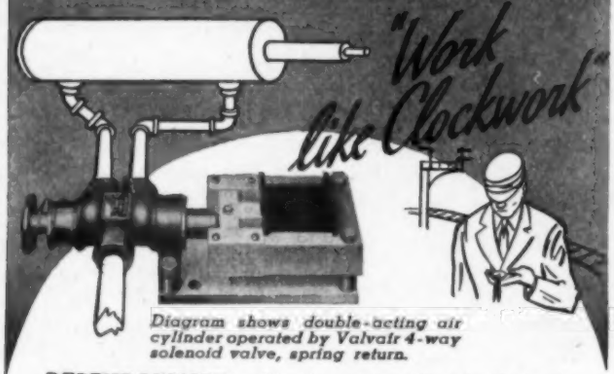


Diagram shows double-acting air cylinder operated by Valvair 4-way solenoid valve, spring return.

DEPENDABILITY—That's outstanding in Valvair performance. Solenoids are Stellite-welded to resist wear; do not mushroom. Standard Valvairs have operated over 2,000,000 times at 100 lbs. with never a leak. *Exclusive features.* Patented basic design eliminates metal seats; non-corrosive (cast bronze body, stainless steel parts); full pipe area used with minimum drop. 2-way, 3-way, 4-way types. Get full details and prices.

Ask for Bulletin AA

VALVAIR CORPORATION • 454 Morgan Avenue, Akron 11, Ohio

Valvair

CUTTING its first teeth!

This big baby is getting a set of teeth that will give years of faithful service in a heavy duty installation. Stahl methods will see that every step in the process, from preliminary selection of the steel to the final inspection and shipment, are carried out by the most advanced methods, on the latest type of equipment, under the supervision of men with years of practical experience.

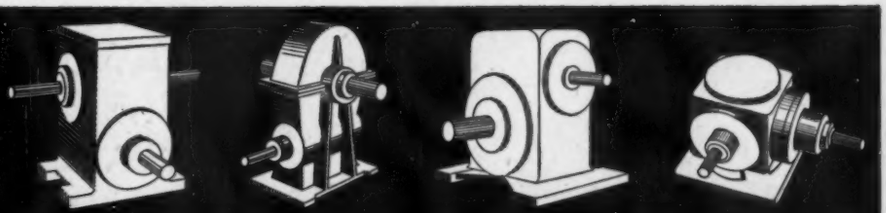
For spurs up to 72" P.D. 1 D.P. . . . for bevels to 54" P.D. 1 D.P., for spirals and helicals to 38" P.D. 2 D.P., worm gears to 48" P.D. 2 D.P. . . . for fabroil, bakelite or rawhide gears . . . any size . . . for racks to 20' long 3 D.P.—or internals 25" P.D. 3 D.P. . . . *get a Stahl estimate first!*

STAHL GEAR & MACHINE CO.
3901 Hamilton Ave., CLEVELAND 14, OHIO

What Speed Reducer shall I use?

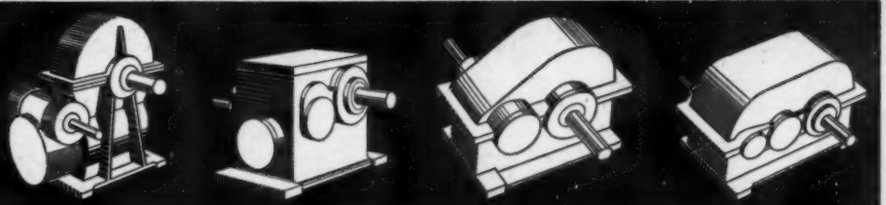
FOR RIGHT ANGLE DRIVES

When you want your driving or motor shaft at right angles with your driven shaft, use any one of these Boston Reductors. Select from these four types depending upon the horsepower or ratio required and the proper type for your application.



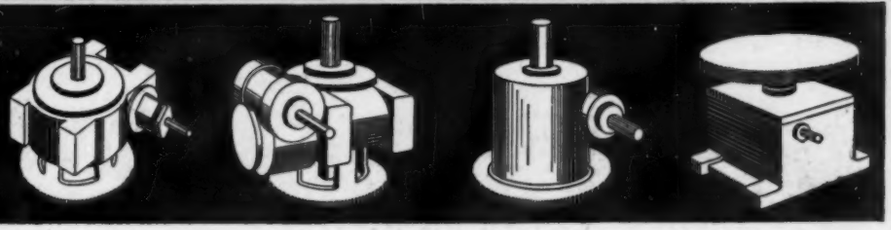
FOR PARALLEL SHAFTS

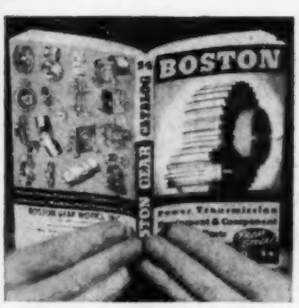
If you desire your driving or motor shaft to be parallel with your driven shaft, use one of these four types. These first two types are double reduction worm and worm gear drives with gear ratios from 16 to 1 as high as 4000 to 1.



FOR VERTICAL DRIVES

You may want a vertical reduction unit for a mixer, conveyor, etc. or where your driven shaft must be vertically up and/or down. These first three types will give you such a versatile drive. The fourth type is strictly a turntable only.





SELECTION A 12-page Reductor or Speed Reducer Selection Chart is included in our General Catalog 54. It contains complete selection data on our Reductors and gives output speeds and gear ratios available, as well as the horsepower motor to use on the Input Shaft of the Reductor. This Selection Chart includes practically all ratios, types and stock sizes available.

DIMENSIONS Complete specifications and dimensions on all Boston Reductors are given in our Catalog 54. If you have a copy of this catalog, you can easily design your drive from the complete dimensions we give you. On some of our Reductors, dimensions are given for elongated Output Shafts which are available as standard assembly. In other cases our speed reducer shafts can project in various other positions as indicated in our catalog.

ORDERING Each and every Boston Reductor has a Catalog Number. No ordering by complicated details after you select whatever ratio, size or type of Reductor you desire. Simply order by Catalog Number.

GENERAL CATALOG If you have need for any speed reduction units in your plant you should have a copy of our 320-page General Catalog 54. It contains complete specifications, dimensions and list prices on all our Power Transmission Equipment and Component Machine Parts — 50 pages of this catalog being devoted to the 12 Reductor types shown above.

BOSTON GEAR WORKS, INC.
NORTH QUINCY 71, MASS.

BOSTON GEAR WORKS, INC., NORTH QUINCY 71, MASS.

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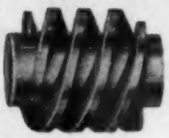
"HARTFORD" for Gears, Cams, Thread-Grinding



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Better Gear Products

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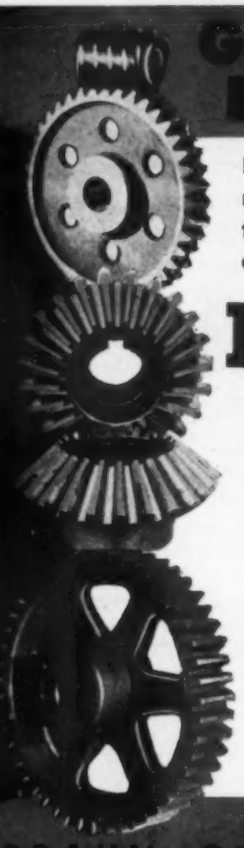

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and the way MEISEL builds gears, there's just one *right* gear for any specific job. Designed for use under conditions that exist, MEISEL Gears actually "belong" to a machine . . . are inherently able to give longer, quieter, more economical service. Investigate the advantages of *specifically* engineered gears by MEISEL.

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Spiral Bevel Gears
HAVE MUCH TO OFFER

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Whether your gear requirements involve standard cut-gears (which we have in stock), or special gears to be cut to your specifications, you can depend on GRANT to give you the kind of service which has resulted in a continuous growth of our business over a period of 64 years.

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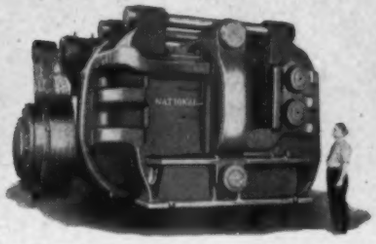
Close tolerances, low weight, minimum finish, proper grain flow and greater output are National advantages that merit your serious consideration.

May we help you investigate?



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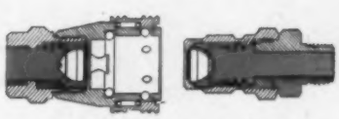
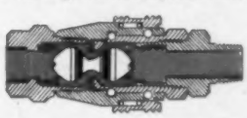
Write for Industrial Catalog

The Hansen Two-Way Shut-Off Coupling.



Red section shows how rubber washer in valve stem contacts valve seat in both plug and socket, sealing both plug and socket against leakage instantly.



Red section shows flow of liquid or gas around spool section of valve, permitting free flow of liquid or gas through coupling instantly upon connection.

THE HANSEN MANUFACTURING CO.

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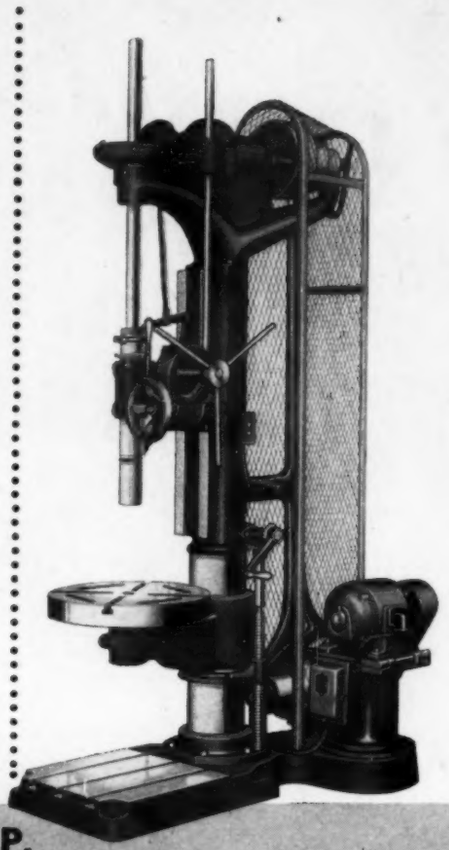
- IMMEDIATE DELIVERY

WRITE FOR CATALOG NO. 66



SIBLEY MACHINE & FOUNDRY CORP.
30 EAST TUTT STREET, SOUTH BEND, IND.

Alloy Steel Service From Seven Warehouses!

AISI **HY-TEN** SAE

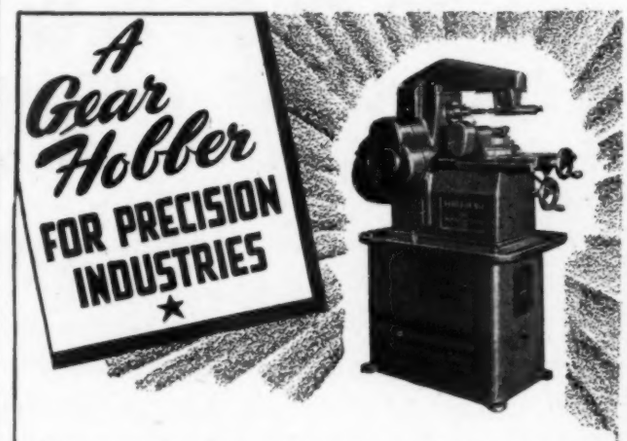
ALLOY STEELS

Cutting to length, Heat treating, Forging. Testing, Turning, Special Finishes. Prompt shipment of rounds, squares, flats, hexagons, octagons, and billets. Technical information and recommendations.

Write for our data sheet book.

Wheelock, Lovejoy & Co., Inc.
(Est. 1846)
128 Sidney St., Cambridge 39, Mass.
CLEVELAND 14 — CHICAGO 23 — HILLSIDE, N. J.
DETROIT 3 — BUFFALO 10 — CINCINNATI 22

A Gear Hobber FOR PRECISION INDUSTRIES ★



If you generate small, precision spur or spiral gears for use in watches, clocks, cameras, business machines, instruments, motion picture machines or other super-accurate devices, investigation of the Hamilton No. 1 Gear Hobber should be high on your list of "things to do."

Easily and quickly "set-up," this machine adapts itself equally well to job lots or long production runs of gears measuring 0.1" to 6" outside diameter. Alignment and trueness of work and hob spindles are held to within .0002". And this accuracy is maintained.

Our Bulletin H-47 provides all pertinent detail. Please write for it.

THE *Hamilton* TOOL COMPANY
818 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

2292

always RIGHT in the groove FOR PRECISION RECESSING, GROOVING, UNDERCUTTING AND FACING

PRICES SHARPLY REDUCED

ON IMPROVED

SCULLY-JONES

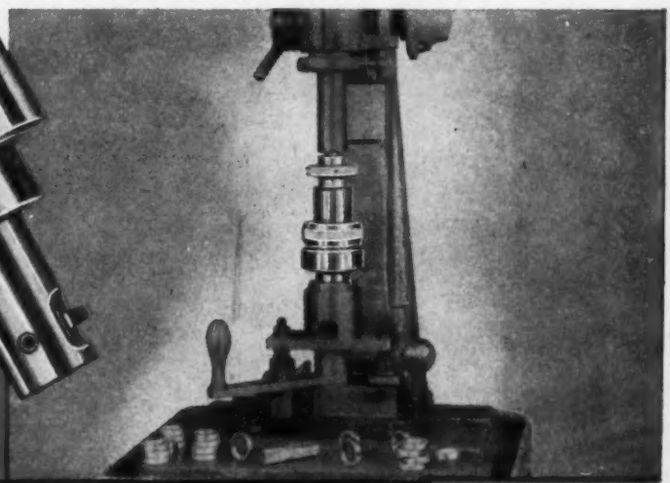
STANDARD AUTOMATIC RECESSING TOOLS

New engineering developments and improved manufacturing facilities enable Scully-Jones, Pioneer in recessing tools, to offer Lower Prices and Prompt Delivery on improved Standard Automatic Recessing Tools.

These recessing tools are piloted in Standard Bushings but, if desired, can be used with Special Stop Collars to permit use without bushings.

Interchangeable tool bit holders and cutter make these recessing tools adaptable to a majority of operations for making reliefs in tapping, threading, grinding and honing operations; for cutting snap-ring grooves, oil labyrinths, chamfers, etc.

If you will send blue prints or describe your recessing problem, our Engineers will gladly suggest the solution.



Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

1902 SOUTH ROCKWELL STREET, CHICAGO 8, U. S. A.

Size "C" Recessing Tool with No. 8 Cutter, for making single recess in 1" collar, operating in a drill press equipped with modified universal jig vise.

SIZE "J"—SIZE "C" REDUCED 50% CUTTERS EXTRA

IMPORTANT DISCOUNT NOTICE

75% of our Standard Tool Prices have been reduced. Write for new discount sheet.

PROMPT DELIVERY . . . WRITE FOR DETAILED LITERATURE

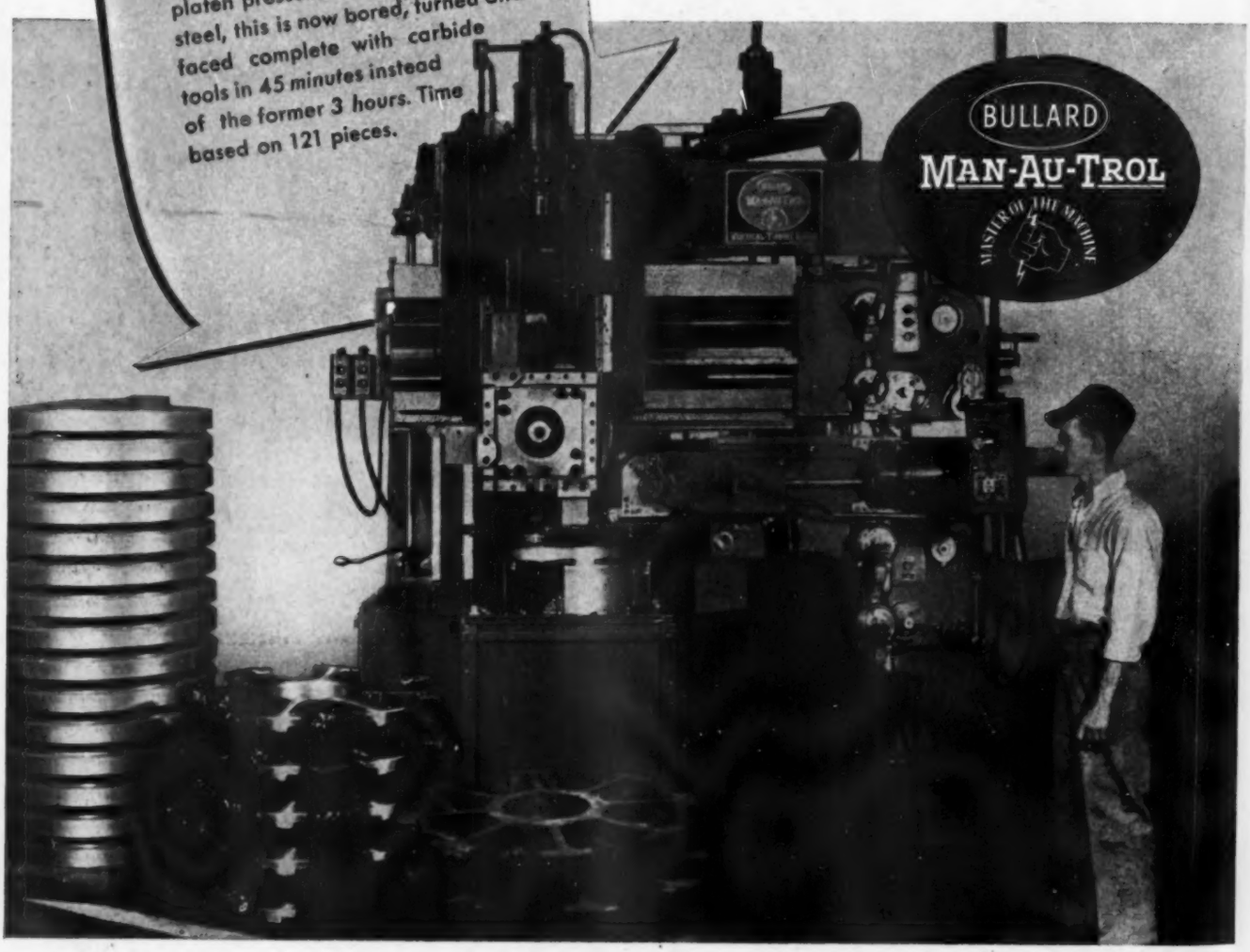
America's largest manufacturer of tire and tube curing presses reports:

Crank Gear Blanks Machined 12 Times Faster on a BULLARD Man-Au-Trol V. T. L.

BULLARD 36" Man-Au-Trol Vertical Turret Lathe is setting new production records for The McNeill Machine & Engineering Co., Akron 11, Ohio. For example: a crank gear blank of welded steel — O. D. 27.166" — which formerly took 4 3/4 hours, is now bored, finished and faced complete in 22 minutes in one setup except for the crank pin bore. Another with 28.500" O. D. is done in 27 minutes. All fractional dimensions held to 1/64" . . . all decimal dimensions to .005". Time based on 500 pieces, produced two months ahead of schedule.

Another job (illustrated here) is steam platen support for tire and platen presses: made of 1045 cast steel, this is now bored, turned and faced complete with carbide tools in 45 minutes instead of the former 3 hours. Time based on 121 pieces.

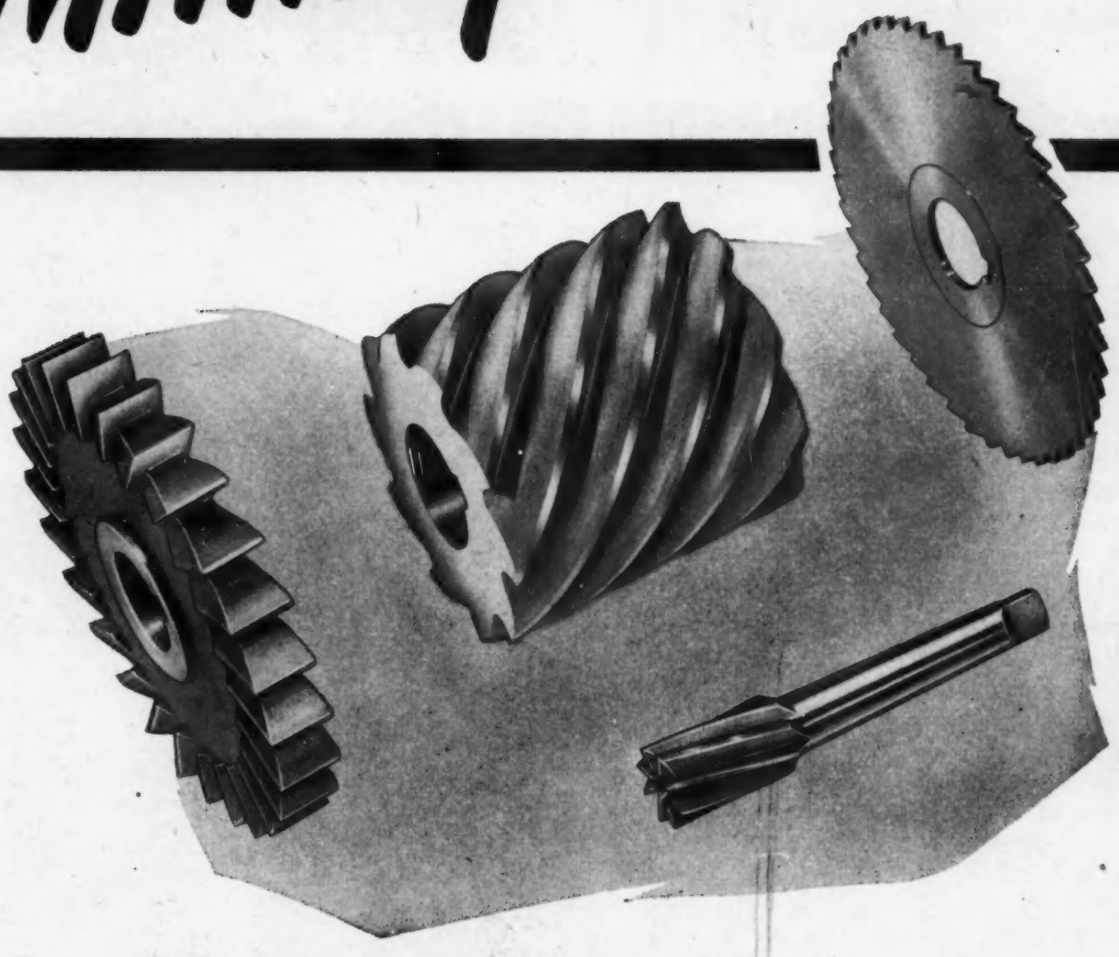
Investigate how the unique productivity, versatility and accuracy of ***BULLARD*** Man-Au-Trol Vertical Turret Lathes can give *you* substantial cost advantages in competitive markets. Write for Bulletin MAV-G-1 today. THE BULLARD COMPANY, Bridgeport 2, Connecticut.



BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

GORHAM STANDARD

Milling Cutters

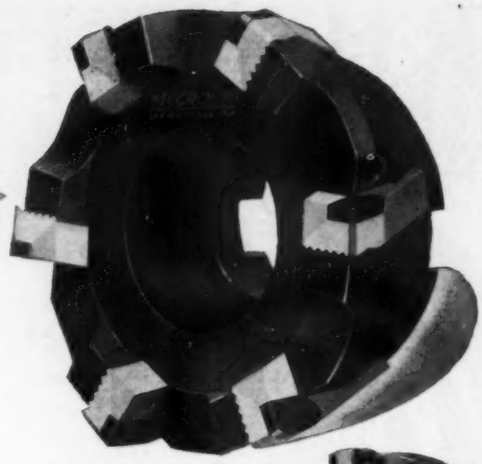


Standard cutters and tool bits carried in stock ready for immediate shipment • Special tools made to your specifications and requirements • Catalog will be sent on request

GORHAM TOOL CO.

14400 WOODROW WILSON • DETROIT 3, MICHIGAN

COST CUTTING TOOLS



McCROSKY

Multi-Duty MILLING CUTTERS

many outstanding advantages . . . high speed, cast alloy or carbide tipped blades

● You'll get more pieces per machine hour—easier—at lower cost—with McCrosky Multi-Duty cutters. Sturdy and ruggedly built, they meet every requirement of the higher feeds and speeds now being employed in most shops, eliminate the danger of tool breakage.

As their name implies, Multi-Duty cutters are general purpose tools. They can be transferred from one machine to another, and used on job after job, thus reducing tool inventories—and inventory costs—to a minimum. And the "Jack-Lock" blade locking device—conceived and perfected by McCrosky engineers—that gives Multi-Duty tools the strength and rigidity of solid tools on the job, permits quick release of the blades, and easy and accurate adjustment, so that a minimum of blade stock is lost in the grinding. Wide range of sizes. Write for Bulletin No. 461. It gives full details.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock Milling Cutters — *Super Adjustable* Reamers
Block Type Boring Bars — *Turret* Tool Posts
Wizard Quick-Change Chucks — *Special* Multiple Operation Tools

Proven Performance

SELLS 6 OUT OF 10 GRAND RAPIDS GRINDERS

Of every ten Grand Rapids Hydraulic Feed Surface Grinders sold, six are to customers already using Gallmeyer and Livingston grinding machinery.

Such customer acceptance and approval is proof of the quality of Grand Rapids Grinders.

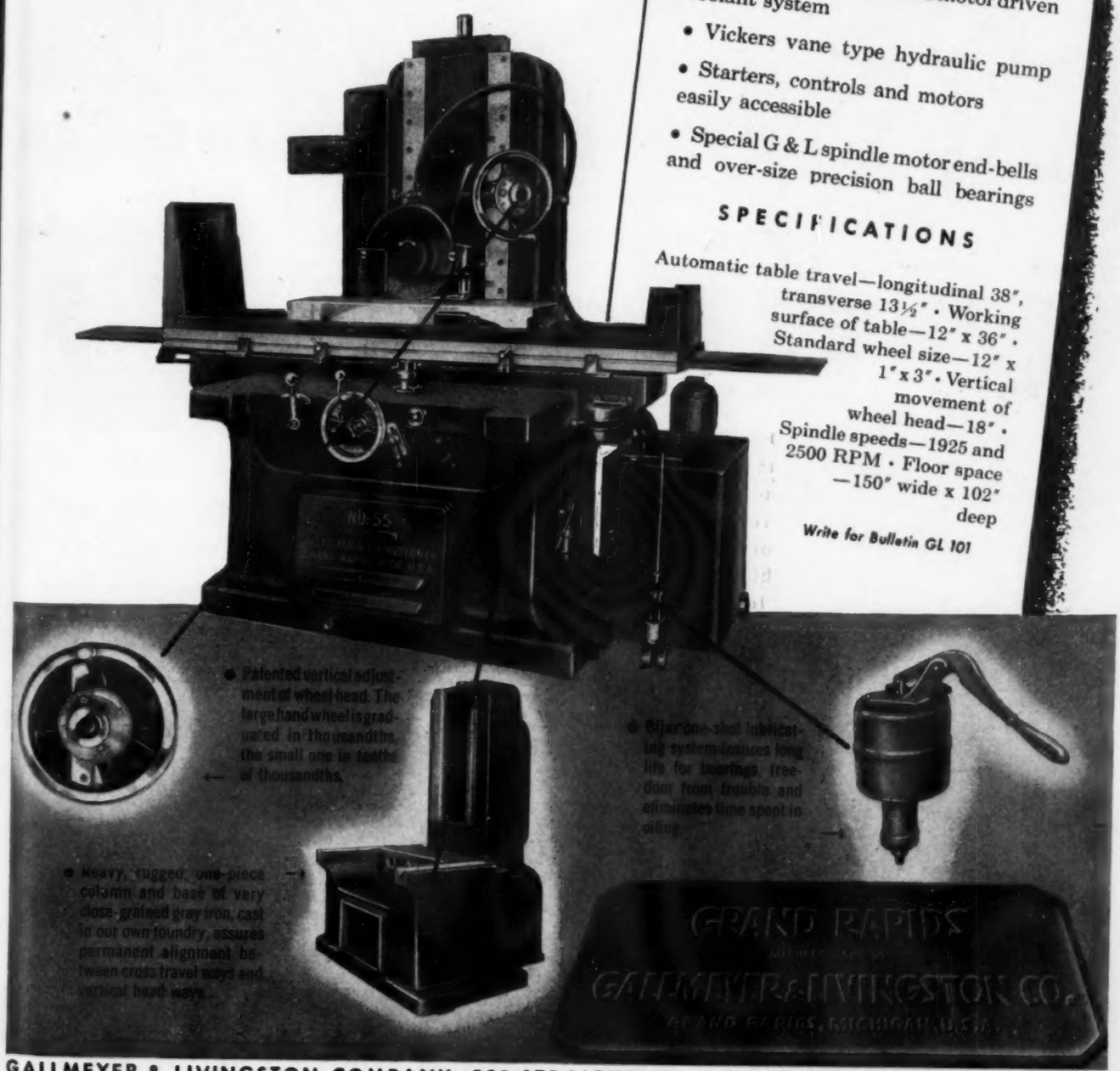
FEATURES

- 125 feet per minute longitudinal table speed
- Separate motors to drive grinding wheel spindle and hydraulic mechanism
- Two spindle speeds to reduce wheel costs
- Portable, self-contained motor driven coolant system
- Vickers vane type hydraulic pump
- Starters, controls and motors easily accessible
- Special G & L spindle motor end-bells and over-size precision ball bearings

SPECIFICATIONS

Automatic table travel—longitudinal 38″, transverse 13½″ • Working surface of table—12″ x 36″ • Standard wheel size—12″ x 1″ x 3″ • Vertical movement of wheel head—18″ • Spindle speeds—1925 and 2500 RPM • Floor space —150″ wide x 102″ deep

Write for Bulletin GL 101


• Patented vertical adjustment of wheel head. The large hand wheel is graduated in thousandths, the small one is tenths of thousandths.
• Bijur one-shot lubricating system insures long life for bearings, freedom from trouble and eliminates time spent in oiling.
• Heavy, rugged, one-piece column and base of very close-grained gray iron, cast in our own foundry, assures permanent alignment between cross travel ways and vertical head ways.
GRAND RAPIDS
GALLMEYER & LIVINGSTON CO.

GALLMEYER & LIVINGSTON COMPANY, 330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICHIGAN

Goss & DeLeeuw

THE WORLD'S FINEST MULTIPLE SPINDLE

Chucking Machines

GOSS & DE LEEUW MACHINE CO.

Kensington, Conn.

GILBERT

PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES

DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

ABRASIVE

ACCURACY BOOSTS PRODUCTION

No. IG	INTERNAL GRINDER	No. 34	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	No. 3B	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

---

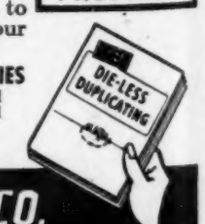
300 TWIN BENDS *per hour!*

With Two DI-ACRO BENDERS A difficult production problem of forming two bends in a long length of tubing was solved by "teaming up" two DI-ACRO Benders as illustrated. This dual-forming arrangement saved installation of special machinery. Two accurately formed bends are obtained in one operation—without distortion of the tube and at a cost competitive to power operated equipment. More than 300 pieces are completed per hour —600 individual bends.

"DIE-LESS DUPLICATING" Often Does it Quicker WITHOUT DIES

This is but one example of how DI-ACRO precision machines—Benders, Brakes and Shears—can accurately and economically duplicate a great variety of parts, pieces and shapes, without die expense. **Write for Catalog—"DIE-LESS DUPLICATING"**

◀ DI-ACRO is pronounced "DIE-ACK-RO".



DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.
311 EIGHTH AVENUE • LAKE CITY, MINNESOTA

For Better Metal Degreasing—
Du Pont Solvents

NOW Du Pont has developed an improved Trichlorethylene which is BETTER THAN EVER. This product and Perchlorethylene are two fine solvents. They are the best Vapor Degreasing solvents we've ever made—the best we know how to make. Use them with complete confidence and assurance for all metal degreasing work. We believe they'll serve you *better!*

UNDER VARIOUS TRADE NAMES, Du Pont Trichlorethylene and Perchlorethylene solvents for metal cleaning have served American industry successfully for many years. If you have used vapor degreasing solvents in your plant, no doubt you have used these solvents made by Du Pont.

copy of "Metal De
E. I. du Pont de N (INC.),
chemicals Department, Wilmington 98, Delaware.

DU PONT SOLVENTS for VAPOR DEGREASING

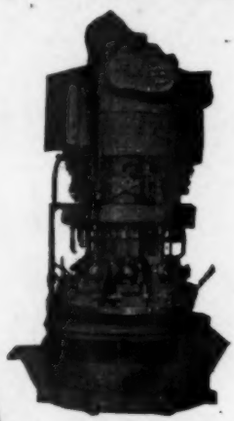
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

SOLD NATIONALLY THROUGH DISTRIBUTORS

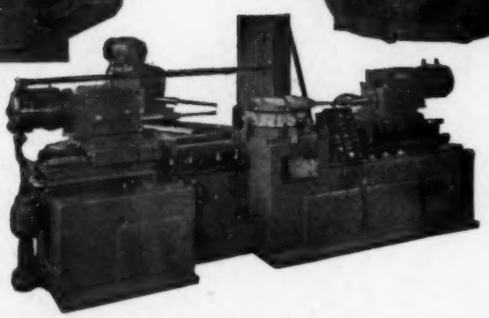
DU PONT
REG. U.S. PAT. OFF.

Roto-Matic Drilling MACHINES

VERTICAL AND HORIZONTAL TYPES



MULTIPLE SPINDLES



Highest Production — Low Maintenance

MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

DAVIS & THOMPSON COMPANY

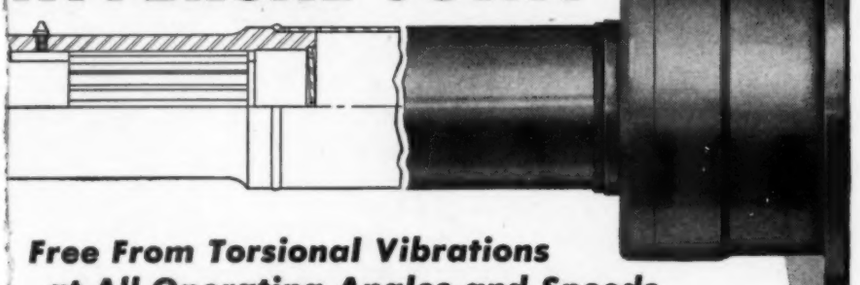
MANUFACTURERS: MACHINE TOOLS, MICROMETERS AND GAGES

MILWAUKEE WISCONSIN

The New **GEARGRIND**

vy Duty—Constant Velocity

NIVERSAL JOINT



Free From Torsional Vibrations at All Operating Angles and Speeds

Delivers CONSTANT VELOCITY Over the Entire Range

● This new high angle, heavy duty propeller shaft universal joint is now in production, after years of severe testing under extreme operating conditions! Enables the engineer to design to meet his particular requirements, because perfectly balanced, compensating joint operating angles are not required as they are with the ordinary cross type joint.

Torque is transmitted through steel balls, positioned in intersecting race ways. A heavy ball socket in the center positions the driving members and maintains true concentricity. The entire joint assembly is completely enclosed, oil being retained by a large tube, pressed on one member and connected to the other by a neoprene diaphragm. Deliveries of certain sizes are now being made.

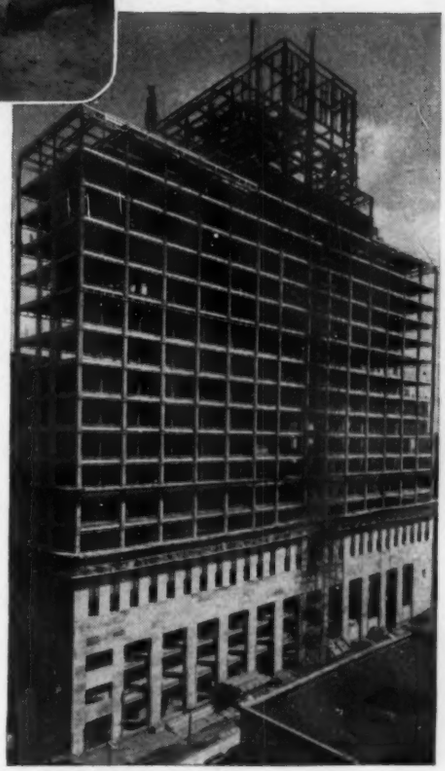
Full Information on Request

The GEAR GRINDING MACHINE COMPANY

DETROIT 11, MICH. U.S.A.

Cameron Iron • Peterson Bros.

Both use SMITHway *Certified* Electrodes



Cameron Iron Works, Houston, manufactures drilling, completion control equipment, and other specialties for oil-field use, including the Cameron Blowout Preventer, a part of which is pictured. SMITHway SW-15 Electrode is shown in use. Cameron, which also uses many SMITHway high tensile electrodes, knows that the *proof* of SMITHway Electrodes is in production—and in service.

Peterson Bros. Construction Co., Houston, steel erectors, used SMITHway Electrodes throughout in welding the new City National Bank Building, Houston. The first four floors were welded with SW-15, all the other floors with SW-10. Peterson Bros., too, know the value of A. O. Smith welding research . . . research that makes welding the modern tool for *all* kinds of jobs, both large and small.

SMITHway *Certified* Welding Electrodes—Made *by* Welders . . . *for* Welders

ASK FOR THE FACTS ON SMITHway A.C. WELDERS!

Models for every kind of welding job—cover every welding range. Lightweight, compact, highly efficient. Write for specifications and prices.

A. O. SMITH Corporation

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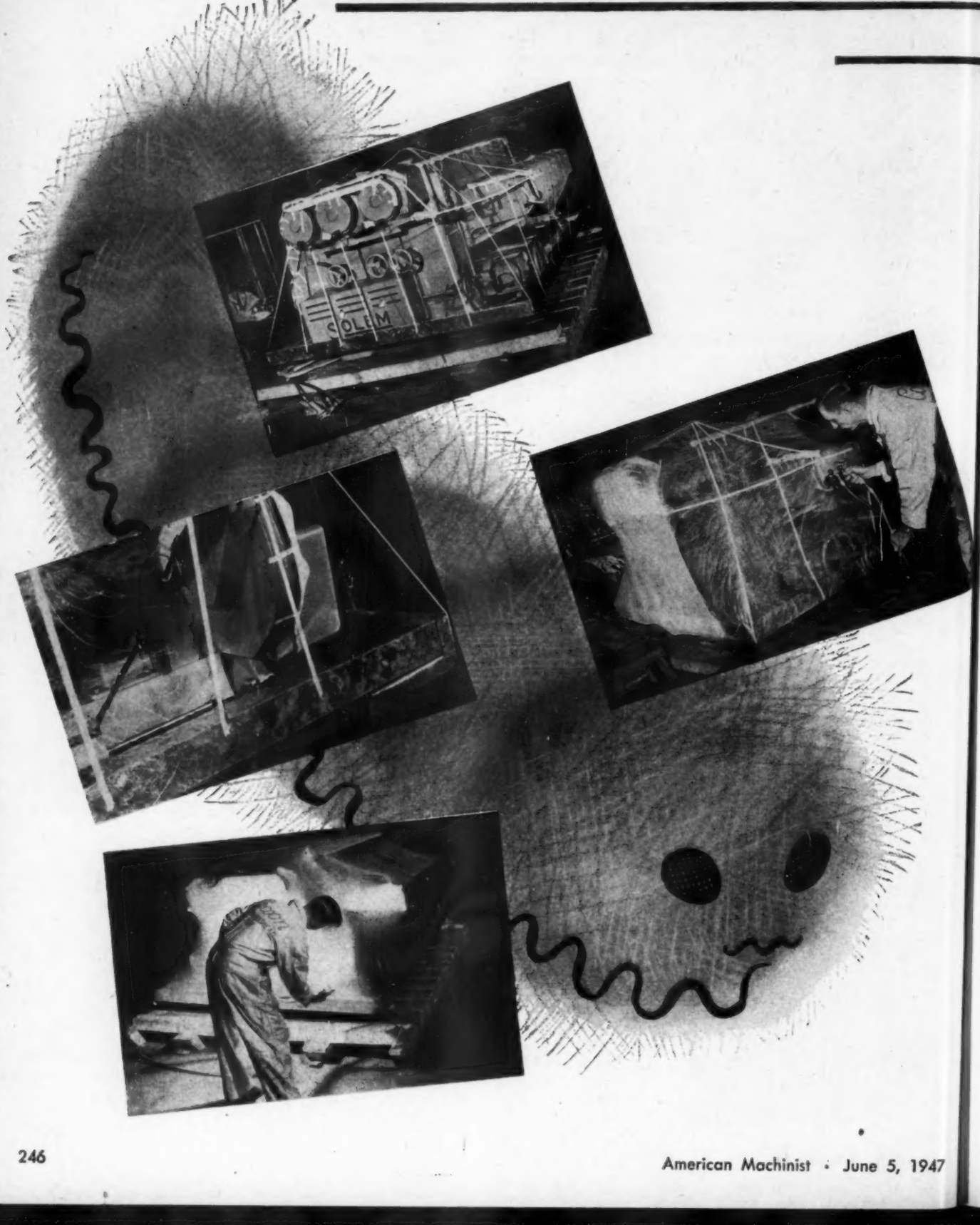
would you understand it - - - -

Man-spun cocoon sets new protection standards



if you didn't see it?

. . . . an excellent example of how American Machinist shows Metalworking better ways of doing things

When, every other week, Metalworking's most influential audience turns from the problems of producing over one-third of all industry's output, to seeking *American Machinist's* help in doing that job better, it's up to us to see they get that help accurately . . . forcefully . . . clearly.

And very often it's not enough to *tell* them about the better methods, materials, machines, or parts which they can put to work. We think we should *show* them as well as tell them . . . with the kind of clear and useful illustrations you see here. Last year, for example, over 2,500 illustrations (plus 2,000 charts and drawings) brought these straight-thinking,* idea-receptive production executives quick and clear information on thousands of new ways to reduce the cost and increase the quality of the things they make.

They need, and want, this same kind of help from you, if you make anything that can contribute to the betterment of the diverse products which Metalworking builds.

And when you have something to sell these men, the advertising pages of *American Machinist* are your most potent means of telling them about it. The editorial excellence of this magazine draws, by many thousands, Metalworking's largest paid readership.* This same editorial excellence leads advertisers like you to place a greater advertising investment in *American Machinist* than in any other metalworking magazine. And this same editorial excellence is the basic reinforcement that assures outstanding results for good advertising.

Your *American Machinist* representative will be glad to *tell and show* you much more about this quality marketplace for your products.

* NET PAID CIRCULATION NOW OVER 28,000. MANY TIMES THIS NUMBER OF READERS

This advertisement, one of a series now appearing in the advertising press, we think will interest you as well as the advertising executives to whom it is primarily addressed. It describes how *American Machinist* uses pictures, charts, and drawings to help metalworking executives like you keep informed about new and better ways of making better products.

Good advertising in Metalworking's No. 1 magazine sells more goods at less cost

A McGraw-Hill Publication • 330 West 42nd St., New York 18, N. Y.

ABC • ABP

Diamond Boring, Turning and Facing Tools; Diamonds for Hardness-Testing; Diamond Gage Contacts; Diamond Styli; Diamond Abrasive and Engraving Tools.

GILMORE DIAMOND TOOLS

meet every demand for precision truing of grinding wheels

Whether for machine or hand truing . . . whether for use in grinding taps, threads, broaches, gages, contour forms . . . in fact for every service where grinding wheels are trued, there is a Gilmore Diamond Tool specially developed for the purpose. Thus by coming to Gilmore for solution of your wheel truing problems you can be assured of a complete, specialized service and take advantage of our long experience as pioneers in the development of modern methods for precision truing of grinding wheels.

Gilmore offers every modern facility for diamond selection, diamond cutting and tool making. Mountings are the result of constant research in laboratory and field. Diamonds are set not only to assure maximum security but also to provide longest-lived cutting edges. Furthermore, Gilmore is prepared to meet your specifications for special diamond tools.

By coming to Gilmore, you can standardize on tools of proved performance and place responsibility for meeting your requirements in experienced, competent hands.

Send at once for a copy of the new 32-page Gilmore Catalog #45 on Diamond Tools. It will help you solve your wheel truing problems.

F. F. GILMORE & CO.
285 COLUMBUS AVE., BOSTON 16, MASS.

If you have a SPECIAL PROBLEM

in any of these operations, where precision work is demanded and where greater production at man-hour savings is paramount—

• BORING—rough, semi-finish and finish • MILLING (special types) • STRAIGHT LINE DRILLING • UNIVERSAL ADJUSTABLE SPINDLE DRILLING • HONING • TAPPING • REAMING • COUNTERBORING • VERTICAL AND WAY-TYPE EQUIPMENT

then a Moline Multiple Spindle Specially Designed machine tool is your answer. Moline tools are ruggedly built and engineered to fit your PARTICULAR requirements, they're made to last for years, they're easy to change over to other jobs, they do better work at less cost and stand up to it longer.

For YOUR special problem, go "HOLE-HOG," write us for any information you may need.

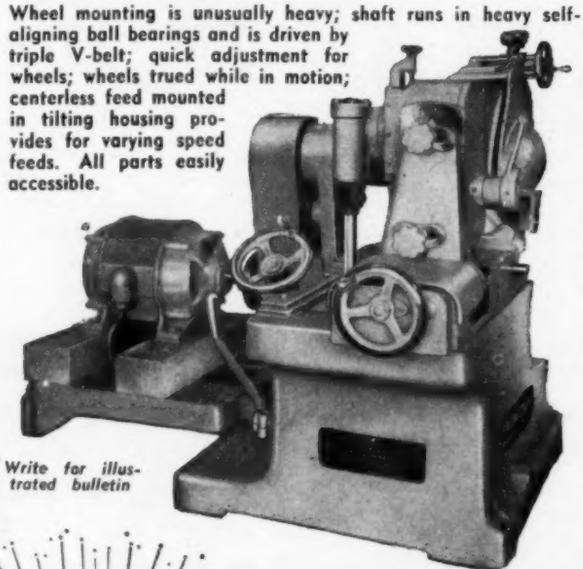
MOLINE TOOL CO.
100 20th Street Moline, Illinois

Put your cylindrical finishing on the CENTERLESS FEED No. 101 "PRODUCTION"

and get better work at lower cost

Any grade finish at fastest feeds and lowest costs can be obtained with this machine.

Wheel mounting is unusually heavy; shaft runs in heavy self-aligning ball bearings and is driven by triple V-belt; quick adjustment for wheels; wheels trued while in motion; centerless feed mounted in tilting housing provides for varying speed feeds. All parts easily accessible.



Write for illustrated bulletin

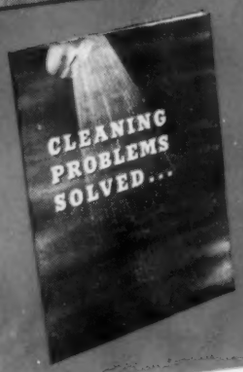
Production
MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

This WHEELABRATOR cleans 100,000 heat treated drills and cutters WEEKLY

With production of a large variety of carbon and high-speed drills, taps, cutters and reamers greatly increased, the Union Twist Drill Co. found that its air-blast cleaning equipment was inadequate. Besides, many of these products could not be cleaned economically in existing equipment.

The installation of a 6′ PLAIN WHEELABRATOR TABLE for removing scale from the larger tools and a 20″ x 27″ WHEELABRATOR TUMBLAST for handling the smaller pieces, satisfactorily solved the problem.

The table cleans more than 100,000 pieces weekly . . . and the TUMBLAST cleans loads containing 1000 to 2000 pieces in ten minutes, whereas formerly more than four hours were required. Thorough scale removal has not only improved the appearance of all products but grinding time has been reduced as well.



Write for our free 20-page illustrated booklet, "CLEANING PROBLEMS SOLVED in the Heat Treating and Forging Industry." Contains complete case history data, comments from users, photos of Wheelabrated products, installation views and types of equipment recommended in this field.

TYPICAL PRODUCTS CLEANED

Gears • Springs • Crankshafts
Bearings • Cutlery • Chain • Drill bits
Axles • Pliers • Lock washers
Saws • Files • Dies • Connecting rods • Shafts • Wrenches • Wheels
Shovels • Piston pins • Plow shares
Hammers • Tool bits • Reamers
Chisels • Axes • Rakes • Rifle parts • Knives • Sprockets • Pinions
Splines • Torsion rods

TYPICAL USERS OF THE WHEELABRATOR

Wyman-Gordon Co.
Billings & Spencer Co.
S.K.F. Industries, Inc.
Plomb Tool Co.
Park Drop Forge Co.
Cushman Chuck Co.
Simonds Saw & Steel Co.
L. S. Starrett Co.
Ex-Cell-O Corporation
Caterpillar Tractor Co.

American
WHEELABRATOR & EQUIPMENT CORP.
(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)
317 S. Byrkit St., Mishawaka, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

When you talk to **him** . . .

UNITED STATES

e talking to the mill!

Our alloy metallurgical service keeps you in direct touch with "alloy steel headquarters"

We emphasize this fact because it is important. For we believe that our alloy metallurgical representatives can serve you best if they are in close and intimate contact not only with your problems but with what our mills and laboratories are doing as well.

The metallurgical representative we assign to contact your plant has been carefully selected because of his special knowledge of the requirements of your business. Although he is on immediate call to give you expert advice whenever you need it, he must spend much of his time at headquarters where he keeps fully informed of the latest developments in alloy steel research and in new uses for alloy steel. He is, in fact, part of our operating department. So, when he calls on you, you are talking to the mill.

When a tougher than usual alloy steel problem comes up, he himself takes it back home to work out the details side by side with our technical staffs. In other words, he acts as *your* personal representative to see that your problem gets the best attention Carnegie-Illinois can give it.

By this direct, personalized service you are assured of receiving at first hand, constant experienced help in alloy steel selection and use, and the most up-to-date information developed by our research and producing departments. It makes a difference in the better results you get in applying U·S·S Carilloy Steels to your needs.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York

7-927

Did you know?

. . . That at Carnegie-Illinois Steel Corporation there are four distinct technological staffs assigned to service adequately every need, whether it be (1) pure research, (2) steel manufacturing and processing research, (3) research on new steels and new uses of steel, or (4) technical service to the consumer.

. . . That in addition to this, consumers or users of steel are also provided with a wealth of information made available by the technological service of sister companies—American Steel & Wire Company, National Tube Company, Columbia Steel Company, and Tennessee Coal, Iron & Railroad Company, as well as those most important research studies provided by the United States Steel Corporation's Research Laboratory at Kearny, New Jersey.

U·S·S Carilloy Steels

USS STEEL — UNITED STATES STEEL

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

STEEL

TOOL FOR PROFIT
WITH
ELGIN
Sapphire
WEAR RESISTANT

SAPPHIRE TIPT MICROMETERS

Precision engineered, light weight, guaranteed accuracy of .0001. Available in English or Metric. Tips remain flat even in grinding room usage. Outwearing steel in the plant of a drill manufacturer as much as 7000 times.

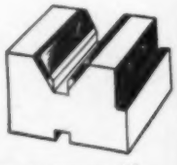
REFER D-10—SAPPHIRE SHORTS

WINDING GUIDES

Sapphire guides abrasive or coated wire, filaments or thread with minimum of wear to the guide and no abrading of wire surface. Variety of shapes. Hole sizes from .003 up. Outwears carbides consistently on every job.

REFER D-9—SAPPHIRE SHORTS

VEE BLOCK

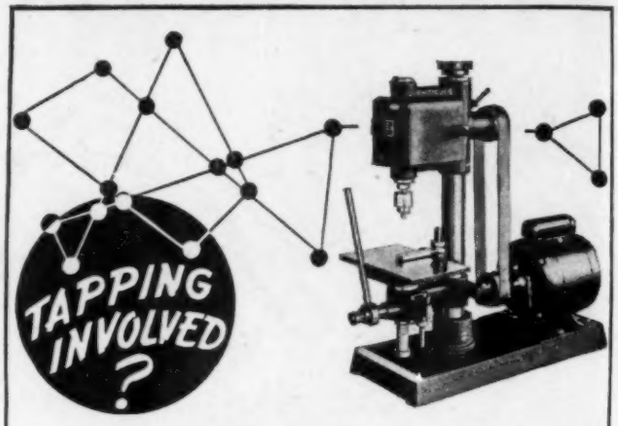


Sapphire faced Vee blocks, gage anvils and wear surfaces provide a true non-wearing, non-magnetic contact area; non-corrosive. Design into your equipment to solve wear problems.

REFER D-13—SAPPHIRE SHORTS

WRITE FOR DETAILS AND ENGINEERING ASSISTANCE

Sapphire
PRODUCTS DIVISION
ELGIN NATIONAL WATCH COMPANY
AURORA • ILLINOIS



Small hole tapping (from the smallest and finest tap to 10-32 inclusive) need not be involved. With the Hamilton Super Sensitive Tapping Machine small hole tapping becomes routine. "Fool proof" in operation, the newest employee can become expert during the first day.

Patented power transmission and adjustable stops permit tapping of blind holes to the very bottom without tap breakage. Spindle idles in reverse while tap is being centered. Pressure to hand feed lever changes spindle rotation and engages tap. Release of pressure reverses and withdraws tap.

Get complete details and specifications. Write today for our Bulletin T-47.

THE Hamilton TOOL COMPANY
SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS
830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

Certifying the spacing of location pins on a fixture, with two combinations of Jo-Blocks.

When the JO-BLOCKS say "it's right" —then it's RIGHT!

When you take a measurement with Jo-Blocks and the Jo-Blocks show the dimension is per specification . . . *that's that!* Genuine Johansson Gage Blocks are warranted accurate to within ±.000002", .000004" or .000008". They are made in America by Ford Motor Company only. They are used by hundreds of manufacturers, as master gages to check working gages, micrometers, etc., as precision layout tools and frequently as actual working gages (since the cost of an individual Jo-Block or two is often appreciably less than that of a specially built working gage).

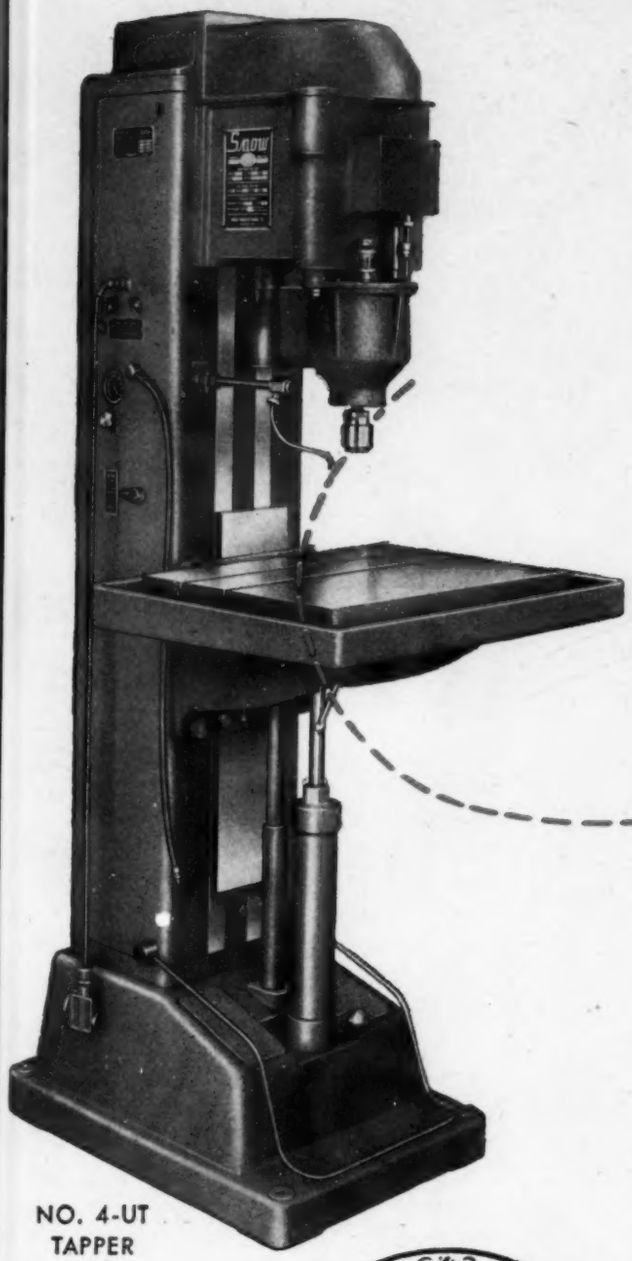
If your plant—particularly your tool-room—is operating without the reassuring control of a set of genuine Ford Jo-Blocks and Accessories, it would be well to consider this very moderate investment. Write for latest literature.

FORD MOTOR COMPANY • JOHANSSON DIVISION
3601 SCHAEFER RD. DEARBORN, MICH.

Ford
Johansson
GAGE BLOCKS

AIR OPERATED • ELECTRICALLY CONTROLLED

FUNCTIONS *three* WAYS



NO. 4-UT
TAPPER

the *basic* SNOW AIR TOOL

Time-tested, quality-proven, thousands have been put into use in the past sixteen years. The Snow Air Tool — fundamental tool around which are built—the Snow Tapping Machine, the Snow Drilling Machine, the Snow Threading Machine.

Air operated—electrically controlled, it includes the latest in design. Quick-acting automatic holding fixtures are made fully automatic, semi-automatic or manually operated—all by the turn of a switch.

Send prints or sample parts for production estimates and for quotations. Or write for catalog.

TOOL
Snow
SNOW MANUFACTURING CO.
617 SOUTH CALIFORNIA AVENUE
CHICAGO 12 • ILLINOIS

SEGMENTS

There is no surer way of selecting the correct hardness for your segmental wheels than through BAY STATE Fractional Grades. This important manufacturing refinement enables you to choose the exact degree of hardness desired by splitting every normal grade into *three* degrees of hardness, where a whole grade change would be too great.

Whether it's straight, cup, cylinder, or segmental wheels that BAY STATE supplies for surfacing equipment, maximum grinding efficiency is assured. Write us for specific recommendations.

Branch Offices and warehouses
Detroit — Chicago
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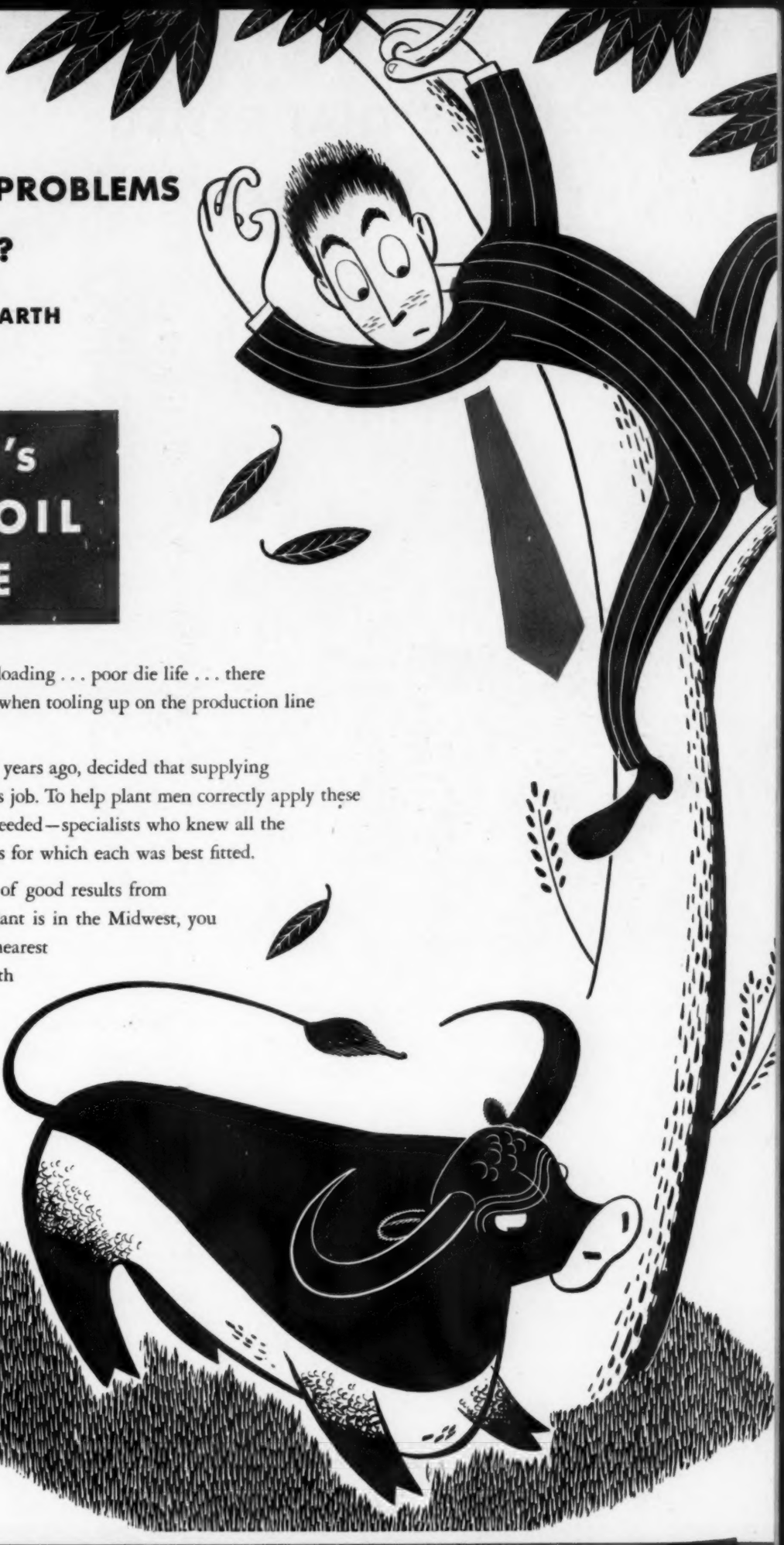
BAY STATE

Top Performance Consistently Duplicated

BAY STATE ABRASIVE PRODUCTS CO. • WESTBORO, MASSACHUSETTS, U.S.A.



DO CUTTING OIL PROBLEMS HAVE YOU TREED?

YOU CAN GET DOWN-TO-EARTH HELP FROM . . .

Standard's CUTTING OIL SERVICE

TAP BREAKAGE . . . tool burning . . . wheel loading . . . poor die life . . . there seems to be no end to problems that arise when tooling up on the production line for a new product or new parts.

That's why Standard Oil, a number of years ago, decided that supplying cost-saving cutting oils was only part of its job. To help plant men correctly apply these cutting oils, trained specialists also were needed—specialists who knew all the available cutting oils and the types of jobs for which each was best fitted.

This know-how gives extra assurance of good results from Standard's Cutting Oil Service. If your plant is in the Midwest, you can get this service simply by calling the nearest Standard Oil office or by writing 910 South Michigan Avenue, Chicago 80, Illinois. Then put your problem up to the Cutting Oil Specialist who calls.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

NOW, GREASES THAT RESIST BOTH HEAT AND WATER

Where you have a heat-and-water problem or where costly machines demand the best possible lubrication, try Stanolith. A Standard Oil Lubrication Engineer will help to make a test. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

WERE YOU ever faced with the problem of lubricating bearings which operated under extremely wet conditions and, at the same time, were subjected to widely varying temperatures? If so, you probably had to choose between a high-temperature grease with poor resistance to water or a water-resistant lubricant with only fair resistance to heat.

Standard Oil's new Stanolith greases end all need for compromise. A lithium soap grease has unusual characteristics which conventional soda soap or lime soap greases cannot duplicate. Stanolith greases resist the washing action of water because they are insoluble in water and also are extremely adhesive. They resist heat because they are made from an extremely stable base oil and a high-melting point soap, and contain an oxidation inhibitor.

Performance Characteristics of Stanolith Greases

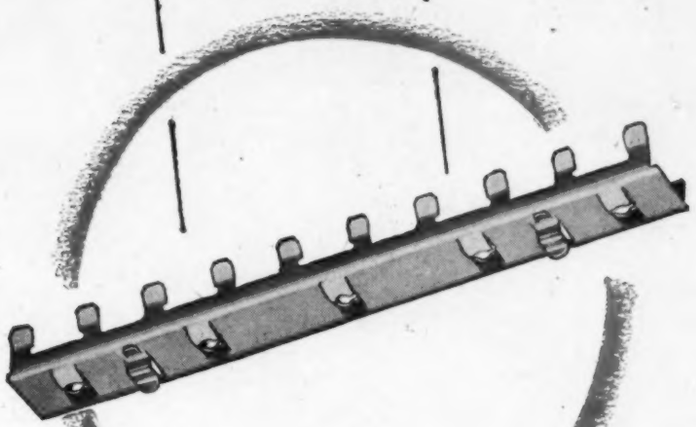
- operate over a wide range of temperatures—have high dropping points.
- have excellent water resistance.
- have unusual mechanical stability—a minimum of oil evaporation and separation.
- contain effective oxidation inhibitors.
- are corrosion resistant.

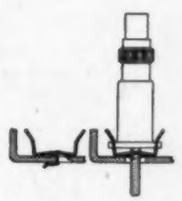
Two grades of Stanolith Greases are available: No. 42—with a No. 1 consistency, and No. 57—with a No. 2 consistency.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

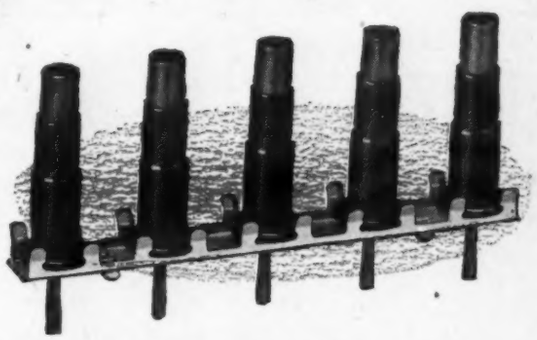
THIS IS A SPEED NUT*

and





THIS *is also a* SPEED NUT



It looks more like a caterpillar than a nut, doesn't it? But a nut it is . . . or rather, five SPEED NUTS combined into one, to simplify and improve the assembly of multiple coil forms on radios.

This one ingenious fastener replaced eight separate parts formerly used and eliminated expensive drilling and tapping operations. It retains the tuning cores and screws, provides exactly the right tension on the screws, and its spring arms hold the plastic coil tubes securely in place.

This is just one example of hundreds where the basic SPEED NUT principle is applied to develop a special fastener for better, more economical assembly. SPEED NUT brand fasteners may be the answer to your quest for lower assembly costs, so be sure to investigate these streamlined fastening devices. Write us today, including engineering details, and we'll give you a complete, no-charge analysis.

TINNERMAN PRODUCTS, INC.,
2211 FULTON ROAD • CLEVELAND, OHIO

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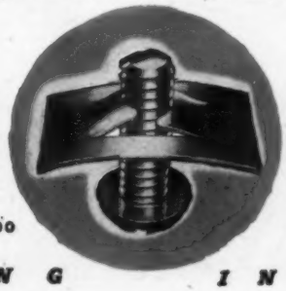

Speed Nuts* PATENTED

*Trade Mark Reg. U. S. Pat. Off.

MORE THAN 4000 SHAPES AND SIZES

FASTEST THING IN FASTENINGS

CARD PIPE TAPS

. . . maintain quality under quantity demands

Card Regular Type High Speed Steel Cut Thread Pipe Taps are ideal tools for high production tapping in cast iron, malleable iron and other materials where chips break up, allowing the tap to properly clear itself.

Card Regular Type High Speed Steel Ground Thread Pipe Taps are recommended for high production tapping in cast iron, malleable iron and other materials where chips break up, allowing the tap to properly clear itself. Used where close accuracy and a high quality of production work is required.

Card Interrupted Thread High Speed Steel Taper Pipe Taps are designed for tapping in soft steel and forgings. They are recommended for use where a particularly fine quality of thread is demanded. These taps have less cutting teeth per thread section, can be operated with less friction and are superior to full thread taps for this class of tapping.

Send for the Card Catalog giving complete details.

SOLD BY LEADING DEALERS

Card Inserted Chaser Taper Pipe Taps are manufactured in carbon and high speed steel types and are furnished with American National Pipe form of thread.

S. W. CARD MANUFACTURING CO.
Mansfield, Mass., U. S. A.
DIVISION OF [illegible] TWIST DRILL CO.
STORES: New York 61 [illegible]; Chicago 11 South Clinton St.; Cleveland 6540 Euclid Av.; Detroit 566 First Avenue, South; Los Angeles 566 South Central Ave.; San Francisco 121 Second St.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

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THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

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CHIEF TOOL ENGINEER

Immediate opportunity for outstanding tool engineer to take complete charge of large tool and production engineering department of New England firm employing 15,000 people.

Must combine administrative ability with intimate technical knowledge of process planning, tool design and modern production techniques in precision metal industry.

Give complete resume of education, experience, age and salary earned.

Address reply to

P-937, AMERICAN MACHINIST
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CARLTON RADIAL DRILL

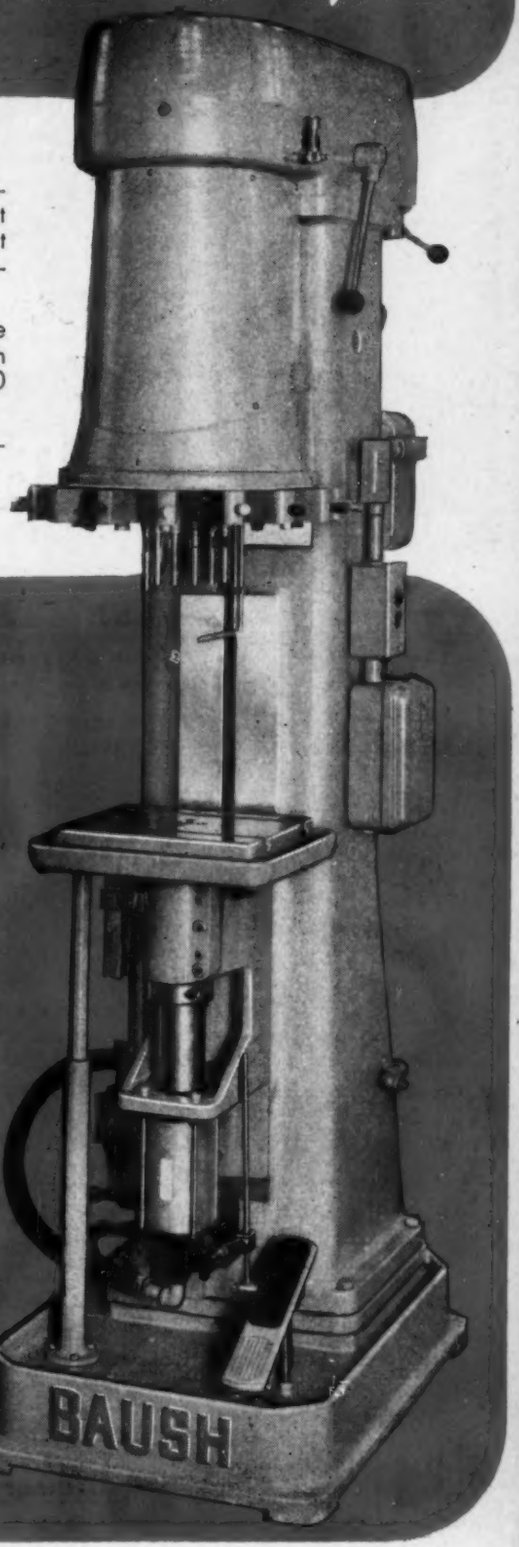
FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.

HIGH SPEED MULTIPLE DRILLER AND TAPPER

...for small holes and layouts



This Baush Model No. 46 High Speed Driller and Tapper is exceptionally versatile — a machine tool that has a place in almost every shop. Adjustable spindles having 4 speed selections permit a wide range of uses in drilling and tapping small holes and layouts in plastics, aluminum, or any light metal.

Sturdily built and designed for long use — it incorporates the same qualities of precision engineering that have enabled Baush to maintain leadership in the machine tool field for more than 50 years.

Let our Engineers show you how this Model No. 46 unit can profitably fit into your production line.

Specifications

Baush Model No. 46 High Speed Multiple Driller and Tapper.

For small diameter holes and layouts.

Hydro-pneumatic feed using air-cylinder from line for pressure.

Feed easily adjusted to give feed in both directions with or without quick approach and quick return.

Motor can be furnished for one direction for drilling only, or reversing with limit switch for both drilling and tapping.

Table can be adjusted for setting at various heights.

Spindles are adjustable type with flexible drive between pinions in head and adjustable arms.

Head 8" Round. Number of spindles 12, either 5/8" or 3/4" diameter.

Maximum feed stroke 4", maximum adjustment of table less feed 12".

Height machine 5' 10", floor space 25" x 19".

Drill capacity 12 1/8" diameter drills driven by 1 horsepower Motor.

Spindle speeds 750 — 1150 — 1750 — and 2600 R.P.M. — latter if angle of spindle driver does not exceed 10°.

Weight: 1100 lbs.

BAUSH

MACHINE TOOL CO.

SPRINGFIELD 7, MASSACHUSETTS

. . . A "REVOLUTION" IN MACHINING INDUSTRY . . .

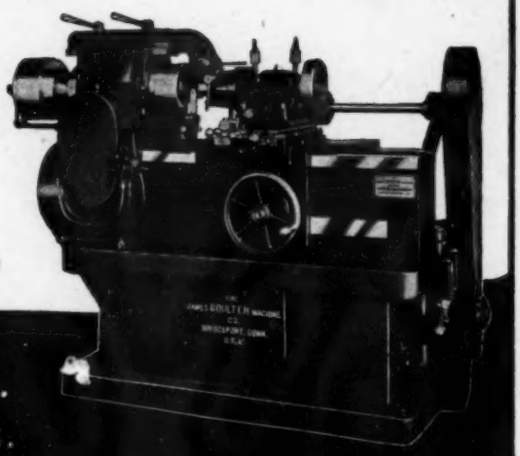
TOUGH Threading jobs licked by COULTER TYPE "H" THREAD TAP MILLING MACHINE

NOW . . . comes a development that extends the capactity of this 'wonder' machine. COULTERS' are made to perform the most delicate threading operation with both speed and accuracy . . . 40 years of specialized experience, manufacturing precision machines exclusively. The NEW Type "H" is equipped with *an overarm tail center and large collet chuck*, holding the work rigidly so *ONLY ONE REVOLUTION OF THE TAP* is necessary.

Any number of FLUTES, eccentric or con-eccentric relief straight or taper can be produced. Pipe taps from 1/8" to 1½" and straight taps from 1/4" to 1½"

WRITE FOR FULL PARTICULARS

PRODUCTION MACHINES SINCE 1896



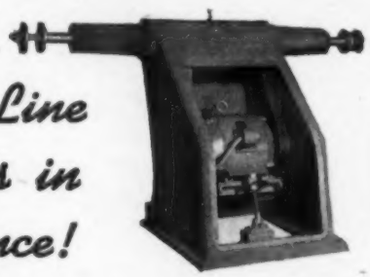
TYPE H

The James **COULTER** *Machine Co.*

BRIDGEPORT • CONNECTICUT • U. S. A.

BRADFORD *Metalmaster* BUFFERS

The Quality Line that's tops in Performance!



We illustrate a Metalmaster, heavy duty, overhang buffer and polisher, 3 to 30 H. P. Spindle and speed to your specifications. Carefully designed and engineered for top performance.

THE BRADFORD MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.
1840—1947

WRITE TODAY

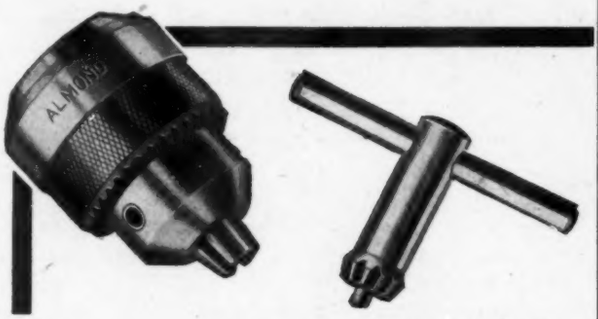
BRADFORD MACHINE TOOL CO. . . . Dept. A
CINCINNATI 4, OHIO

GENTLEMEN: Please send without obligation complete information on the Bradford line.

NAME _____

COMPANY _____

CITY _____ STATE _____



Almond Drill Chuck

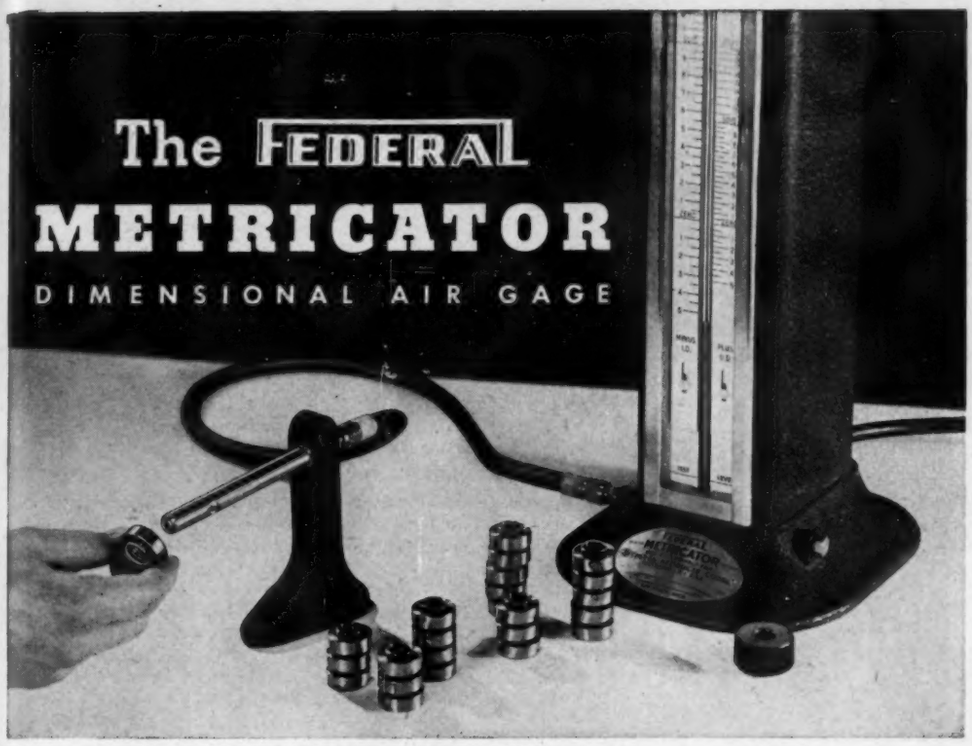
THE FIRST IN THE FIELD

ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

Complete information is available on request.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.



Simplest to set up — simplest to operate — shows actual dimensional variations — not merely rejects.

The simplest in design and construction

—that means positive accuracy, economy, foolproof operation

THIS dimensional air gage has only two operating units — the gaging head and the indicator column. No special skill is required in applying the gaging head to either inside or outside dimensions; it guides and locates itself. Dimensional variations as small as .000025" are amplified thousands of times so that they are easy to see on the numbered scale.

The Federal Metricator requires *no* pressure regulators, filters, constant pressure controls, drains, floats or other mechanical controls. Air is drawn from your own air supply or from an inexpensive 1/12 H.P. compressor. Ordinary tap water is used in the indicator column. Only *one* master is required for setting and checking the gage.

The complete simplicity of this precision instrument means foolproof operation, when the accuracy of workpiece dimensions is to be measured. It offers many other practical advantages . . .

By actually *measuring* dimensional variations — instead of merely *comparing* — you salvage a high percentage of your former rejects.

Several gaging heads of various sizes can be operated from the same indicator column. When interchanging heads of different sizes, no adjustments are required — and no change in the scale. Several different dimensions can be inspected *simultaneously* by the use of an indicating column equipped with multiple measuring scales.

The accuracy of the Federal Metricator is *not* dependent upon springs, sensitive calibrated tubes or precision glass tubes. Its positive, self-compensating pressure control cannot go wrong. The non-adjustable master jet maintains *fixed* gaging accuracy. Even dirt in the water — and dirt and moisture in the air line — have no effect on this accuracy.

Because air requires no mechanical contacts and can be directed into places frequently inaccessible by mechanical gages — the Federal Metricator is both adaptable and efficient for gaging hard-to-get-at dimensions, soft materials and fine finishes.

In total life the cost of the gaging heads is much *less* than that of conventional plugs; a gaging head outwears the mechanical go, no-go plug hundreds of times.

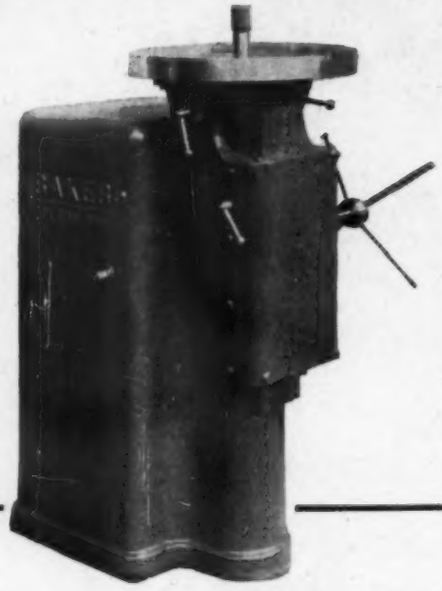
The Federal Metricator furnishes a better way to gage many critical dimensions; it is well worth your careful consideration. Write for illustrated Bulletin No. 20 and a demonstration, if desired.

FEDERAL
PRODUCTS CORPORATION
1144 EDDY STREET • PROVIDENCE 1, R. I.

• Dimensional Dial Indicators and Indicating Gages — mechanical, electronic, air, multi-dimensional • Automatic Sorting • Dimensional Machine Control • Combinations of these methods. For the Mechanical, Textile, Rubber, Paper and all industries requiring dimensional accuracy.

BAKER

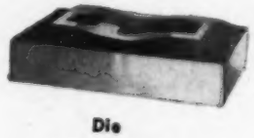
CONTOUR GRINDER



ACCURATE, COST-SAVING PERFORMANCE

On Work like this . . .

Flat Cam



Die

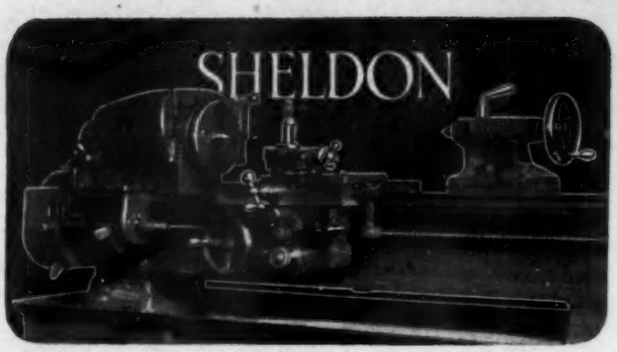
Lever

Contour Grinding is *rapid, economical* and *accurate*... with this Baker Model No. 3 Grinder for grinding inside or outside irregular contours . . . and reforming dies when worn from use.

Performs hand grinding which other types of grinders won't readily handle. Has vertical reciprocating movement of spindle—3/16". Diamond dresser is standard equipment and is quickly mounted. Capacity, diameter of wheels—1/2" to 4". Capacity, face of wheels—2", 2 1/2", 3". Diameter of table 18". Write for illustrated circular.

See us at MACHINE TOOL SHOW Chicago—Sept. 17-26 BOOTH 639 & 681

BAKER BROTHERS, Inc.
TOLEDO, OHIO
DRILLING—TAPPING—KEYSEATING—CONTOUR GRINDING MACHINES



What do they say?

We asked the users why they preferred the Sheldon S-56 Lathe. They said:

"It's rugged"—The bed is heavy, the bearings large.

"Large hole in spindle"—There's a 1 5/16" hole thru the spindle.

"Collet Capacity" and "Extra Capacity"—It has 1" collet capacity and 11 1/4" swing.

"The drive"—4-speed (8 spindle speeds) V-belt underneath motor drive, has double V-belts to the spindle that minimize power loss.

"It's really accurate, does real precision work"—Ways, lead screws, spindles, etc., are held to the very closest tolerances.

"The S-56 is big enough to handle most lathe jobs, still is low enough in price for my shop"—Only complete tooling and newly developed special machinery make it possible to build so fine a lathe at S-56 prices.

In the new TRB-S56 you get all this and in addition an even heavier headstock with "Zero Precision" tapered roller spindle bearings.

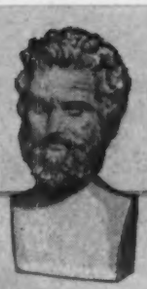
Write for circular

SHELDON MACHINE CO. Inc.
Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
4234N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

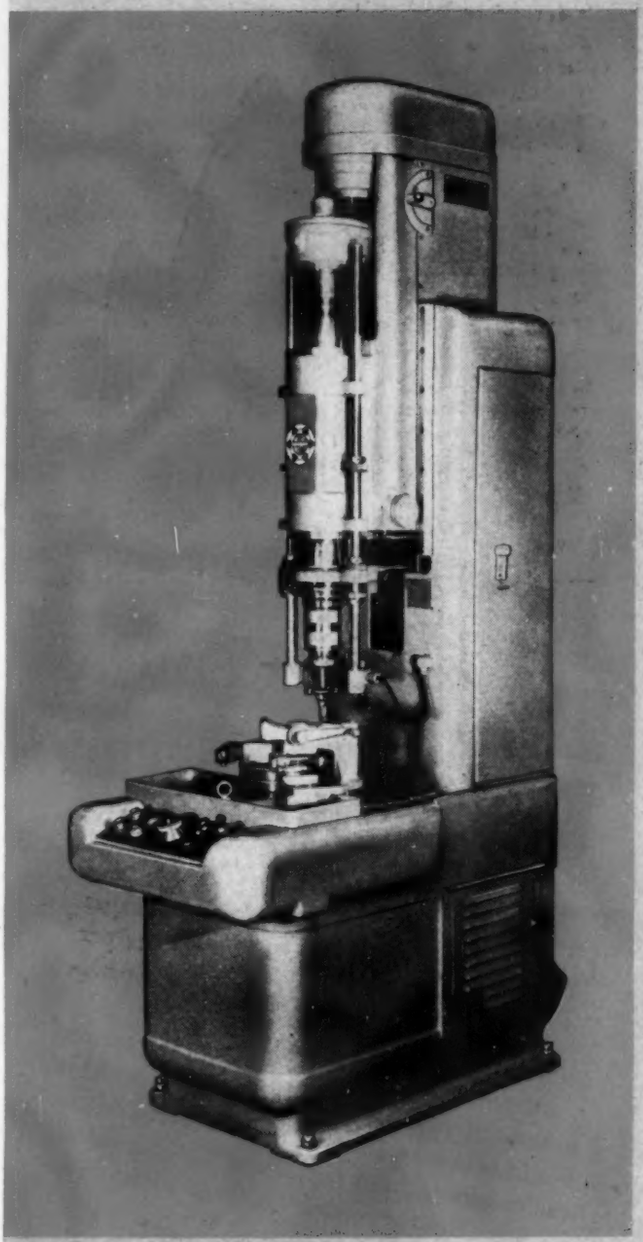
ELIMINATE GUESSWORK . . . *SPECIFY* ABBOTT

THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.

the greeks had NO WORD for it



"Precisionizing"



definition:
BETTER PRECISION MACHINING AT LOWER COST . . . BY MEANS OF

MICROHONING

The *quicker, better, lower cost method,* Micromatic "Precisionizing" includes automatic sizing, high stock removal and generation of a round and straight bore. As the piece is MICROHONED, it is automatically gauged during the operation. When correct size is reached, MICROHONING is automatically halted. Precision is within .0002" to .0005" in fast production.

Significant reduction of processing time—increase in production — reduction of rejects and scrap—make very important savings in costs. Because the skill is built into the machine, there is much less dependence on the human element. A better product is obtained along with the lower cost.

Write for INFORMATION ON THE "PRECISIONIZING" PROCESS AS IT AFFECTS YOUR OPERATIONS

MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

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AIR POWERED
SCREW DRIVER IS THE ANSWER

MINIMUM SPOILAGE

EASE OF HANDLING

INCREASED PRODUCTION

The picture above shows an Ingersoll-Rand Size OOOBLC air-powered screw driver applying four No. 8 screws that hold the leads to the brick on an automatic waffle iron. This insulating brick is very brittle and torque on the screw must be accurately controlled.

The I-R Screw Driver features a cushion clutch that minimizes rotary impacts and allows delicate torque adjustment. An integral part of the cushion clutch is an engaging clutch which permits the motor to run but rotates the bit only when the operator exerts a slight forward pressure on the screw driver.

Air tools are definitely superior for screw driving. I-R Screw Drivers offer you many advantages ...small size...light weight...more power per pound...accurate torque adjustment...dependability...run cool to the touch.

Air-powered screw drivers may be the answer to some of your problems. A reversible model is available in every instance where a reversible tool can be used to greater advantage. Call our nearest branch office for further details or a demonstration.

Ingersoll-Rand

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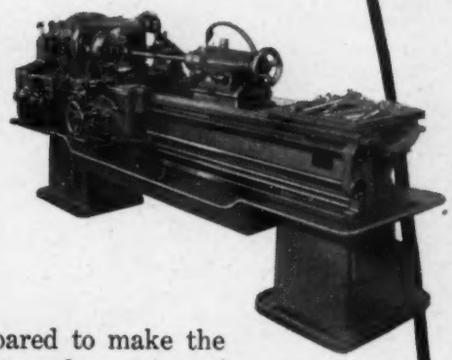
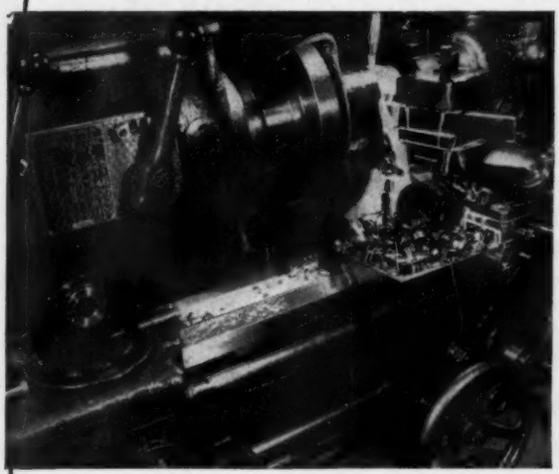
8-990

COMPRESSORS • AIR TOOLS
ROCK DRILLS • TURBO BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS
OIL & GAS ENGINES

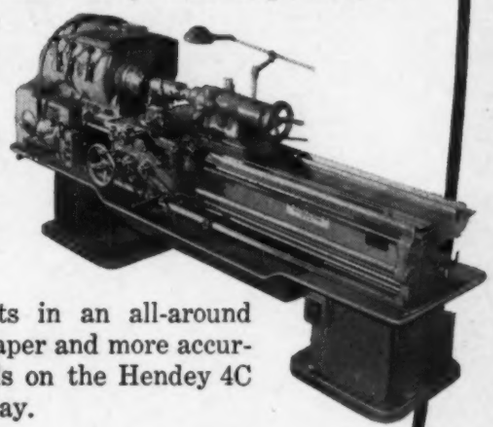
OUTSTANDING AS AN ALL-AROUND PERFORMER
The 4C Will Lower Your Production Costs



Idle machines are especially expensive machines today when the surest way to gain a competitive advantage is to lower production costs. That's why the Hendey 4C, an all-around performer, should be on your production line. It is a manufacturing lathe that will handle a wide variety of work, being especially designed for long-run operation with speed, precision and economy, yet fully capable of quick change-over to accommodate many different short run jobs.



No effort has been spared to make the 4C a versatile, low-cost producer. A twelve-speed geared headstock, plus a unique change gear train, provides a great number of feeds and speeds to enable the most efficient use of the most modern metal cutting tools. Starting and stopping has been made a split-second operation by virtue of a special multiple disc clutch and cone brake to cut "down time" to a minimum. Accurate indexing for cutting multiple threads is provided by precise graduations engraved on the spindle collar. The apron design allows for taper turning up to 45° and, when complemented by the taper attachment, this angle can be increased to 48½°.



Construction, too, is outstanding. Selected materials are used throughout, and every part and assembly, plus the finished machine, is thoroughly checked for quality and accuracy. For instance every lead screw used on a Hendey 4C must test out to ± .001" per foot of lead.

Such a combination of features naturally results in an all-around performer—a machine that will produce faster, cheaper and more accurately. That's why it will pay you to get full details on the Hendey 4C manufacturing lathe. Write for the free catalog today.

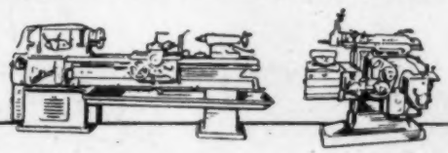
The Hendey Machine Company

Hendey

Main Office and Plant — Torrington, Connecticut

Offices — N. Y., Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

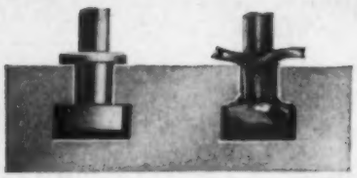
Representatives in — Philadelphia, Cleveland, Pittsburgh

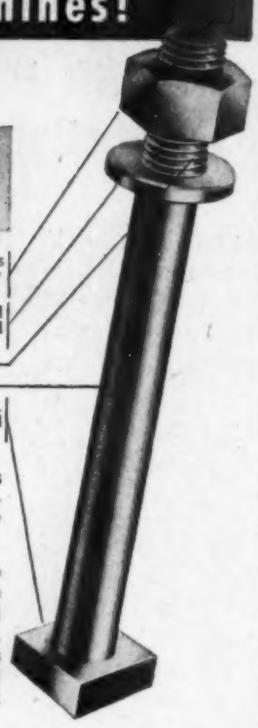


TOOL ROOM LATHES
12" - 14" - 16" - 18" - 20"

SHAPERS
12" - 16" - 20"

Protect this VITAL PART of Your Machines!





NUT of alloy steel, heat treated with Class 3 fit thread, and washer face commercially square with threads.

WASHER heat treated steel, chamfered edges. Ground to uniform thickness and hardened.

THREADS Class 3 fit.

SHANK ground for accuracy.

HEAD Machined square with shank. Square, flat surface of head fits machined surface of T-slot.

It is cheaper to use precision made bolts than to repair expensive machines. Poorly made bolts of soft steels can quickly ruin the accuracy of a machine.

Boyar-Schultz S. M. B. Bolts are made to protect the T-Slot. They are precision made from upset alloy steel forgings and threaded for a Class 3 fit. Use S. M. B. Nuts and Washers with S. M. B Bolts for firm, delicate adjustments. They hold work in exact position for heaviest machine cuts.

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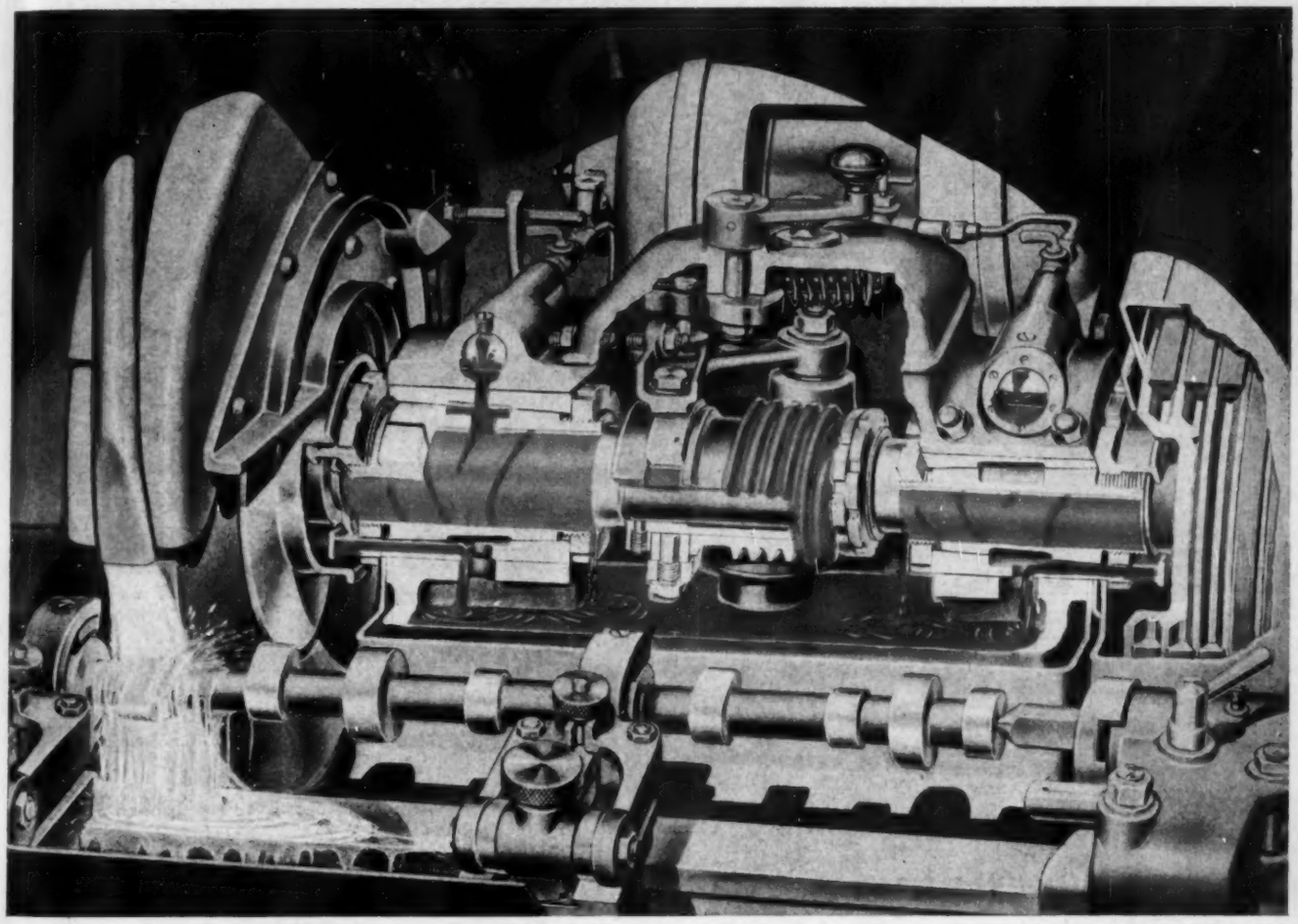
Inside Knowledge on Lubrication Problems
— CLOSE CLEARANCES —
This Is One of a Series of Messages on Common Problems in Your Plant



THIS MODERN precision grinder gives lubricating oil a close play. In fact, the clearances between that spindle and bearing are so close that they might be called "zero clearances." At the same time, the spindle is speeding at 800 to 1,200 R.P.M.

Combined, these conditions cause severe friction within the oil itself. The resulting heat speeds oxidation, can cause rapid deterioration of the oil.

To prevent this, you need an oil with exceptionally high chemical stability, an oil that will resist oxidation under internal friction and heat. Also, this oil must provide strong, persistent films to protect the spindle and bearings during the critical warm-up period.

Gargoyle Velocite Oil E penetrates quickly into the small clearances, minimizes internal friction and heat and provides maximum protection for all working parts at all times. Approved by machine builders and proved in thousands of machines during the past few years, this superior product helps maintain continuous, accurate production.

Get this proved lubricant when you have a close play inside your machines.

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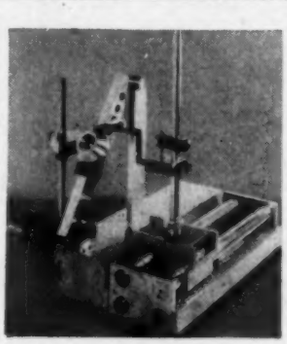

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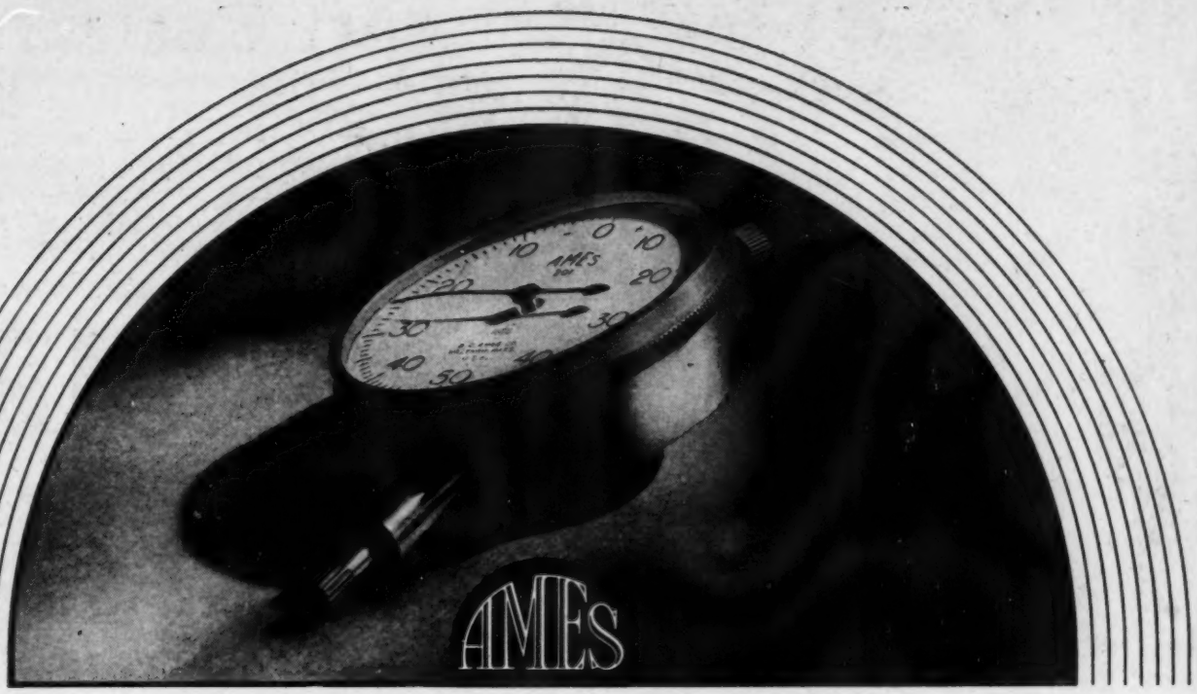

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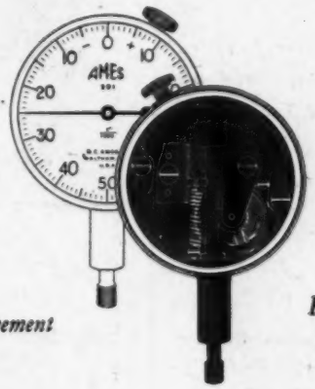

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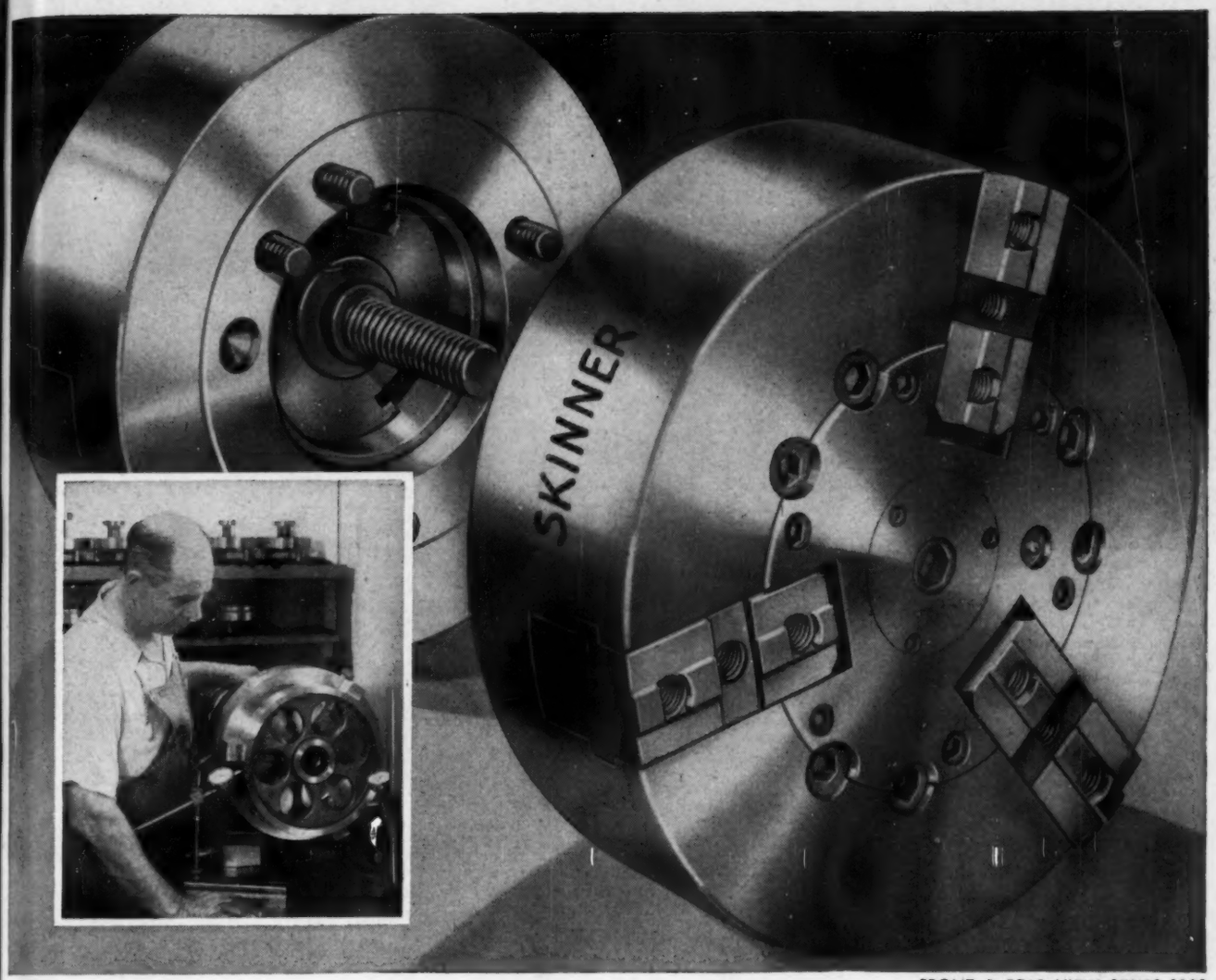

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OK *Milling and Boring Tools*

See Issue March 27, 1947 American Machinist

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STANDARD ENGINEERS NOTEBOOK

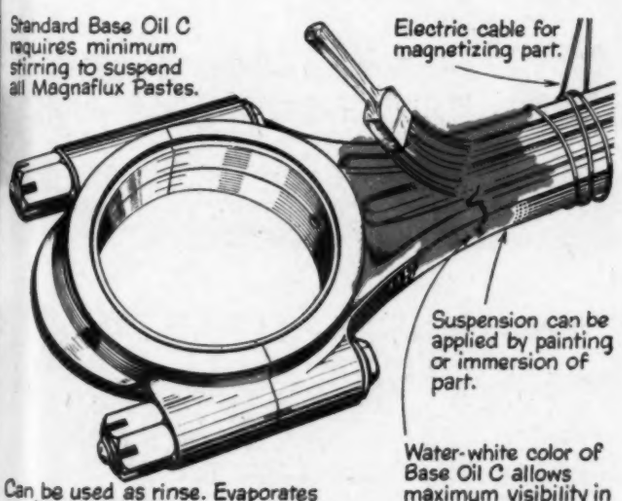
CALOL RPM

Oil for Magnaflux tests leaves no film on parts

The Magnaflux Corporation, makers of Magnaflux Pastes used in the detection of surface and subsurface defects in steel parts, recommend Standard Base Oil C as the paste carrier in the wet method of inspection. They also recommend it as the rinse.

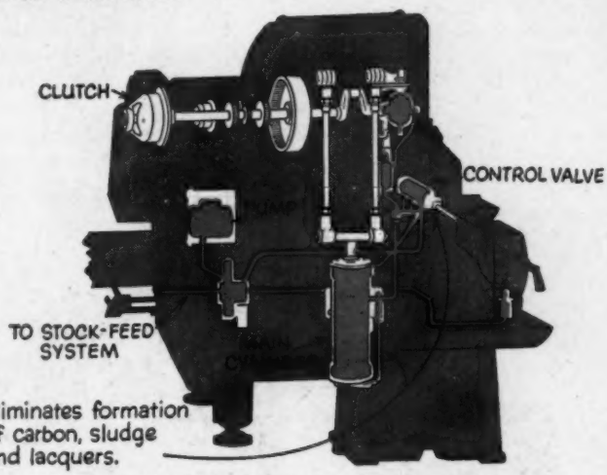
Standard Base Oil C is a neutral oil, so highly refined that it is water-white in color. In both the continuous and residual system this allows maximum visibility and makes inspection easier. Standard Base Oil C leaves no oily film on parts and gives off no objectionable odors. Any oil that remains from the rinse evaporates rapidly and leaves a distinct powder pattern at defects.

All Magnaflux Pastes can be suspended easily in Standard Base Oil C – and very little stirring is required. Most operators use 10 gallons of oil with 1 to 2½ pounds of Magnaflux Pastes No. 7 Black, Nos. 9 and 9a Red, and 10 gallons of oil with 4 ounces of No. 10 Magnaglo.


Standard Base Oil C requires minimum stirring to suspend all Magnaflux Pastes.
Electric cable for magnetizing part.
Suspension can be applied by painting or immersion of part.
Water-white color of Base Oil C allows maximum visibility in defect detection.
Can be used as rinse. Evaporates readily. Does not leave oily film.

Calol O-C Turbine Oil is highly refined — almost water white.

Contains both corrosion and oxidation inhibitors.



Hydraulic Saw-Feed System on Metal-Cutting Saw.

Inhibited oil stops hydraulic system clogging

The formation of rust, gum and lacquer on cylinders, pistons and valves in hydraulic systems on machine tools may be eliminated by specifying Calol O-C Turbine Oil as the hydraulic medium.

This specially made oil contains both corrosion and oxidation inhibitors. Its resistance to deterioration from oxidation is so great that it is rarely necessary to replace original charges in hydraulic units when contaminants are properly excluded—only oil actually lost need be replaced.

Calol O-C Turbine Oil is also widely used in steam turbines by operators who require the finest turbine oil available. It assures protection against rust in initial operation as well as throughout the life of the oil-charge.

Calol O-C Turbine Oil will withstand high operating temperatures and pressures, and is highly moisture-resistant. Comes in four viscosity grades: 9, 11, 15 and 19.

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vibration

as applied to

mechanical engineering

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Professor of Mechanical Engineering, Massachusetts Institute of Technology

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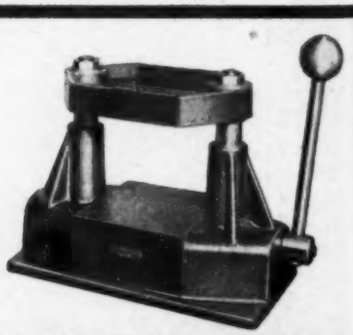

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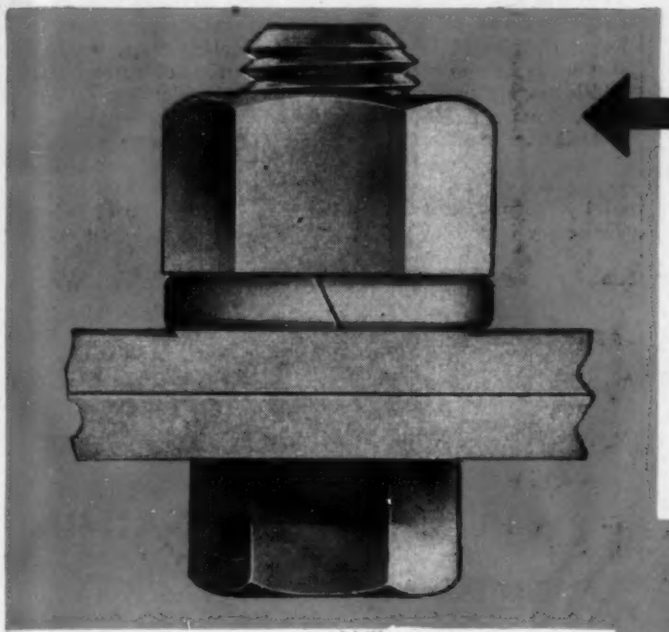

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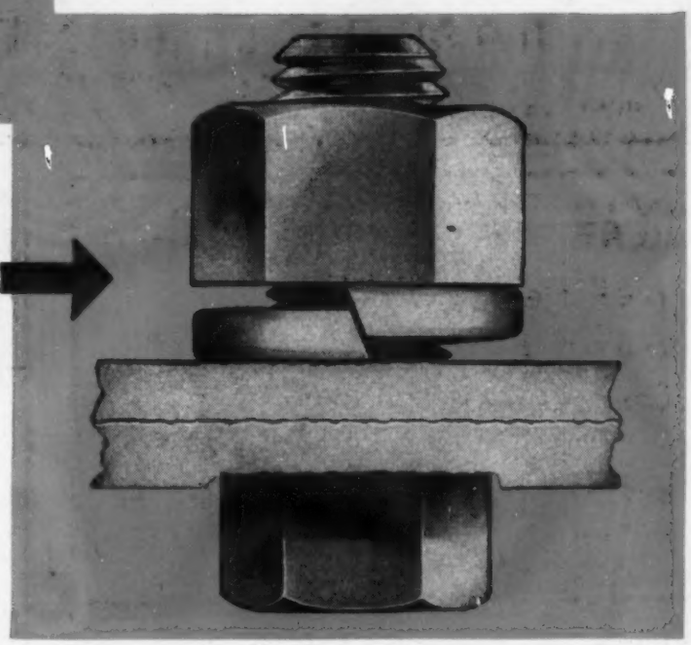

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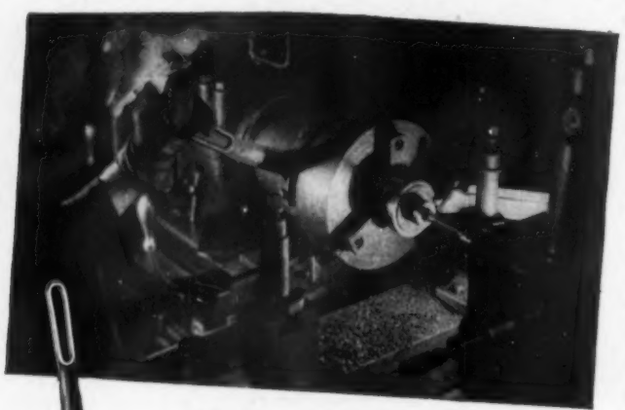

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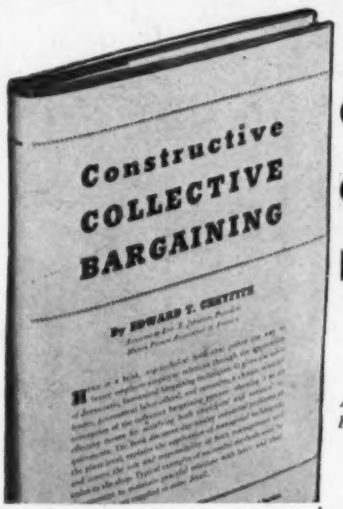

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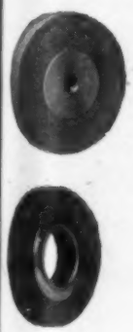

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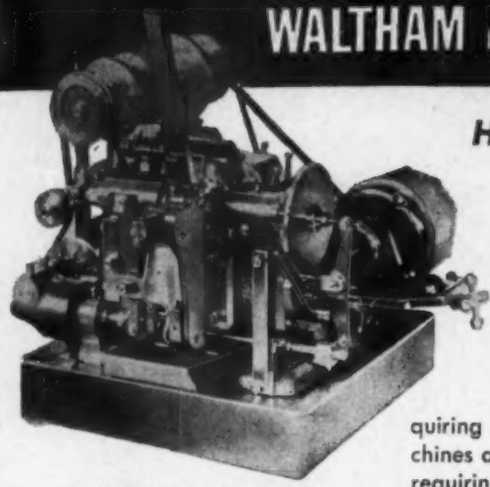

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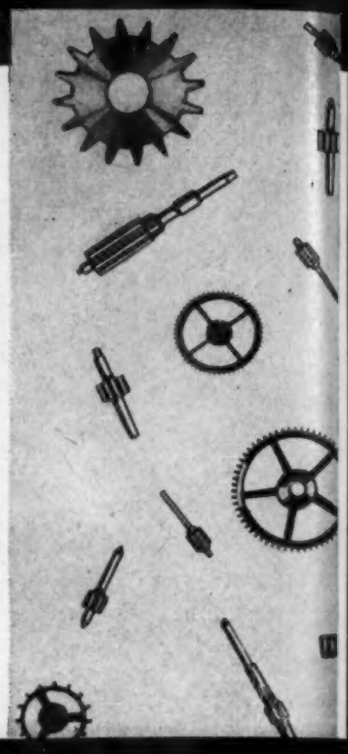

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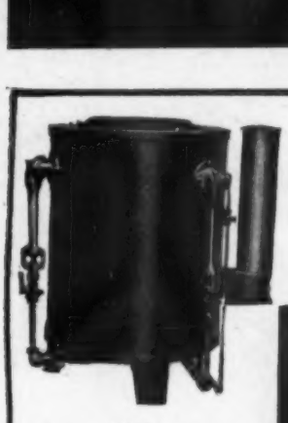

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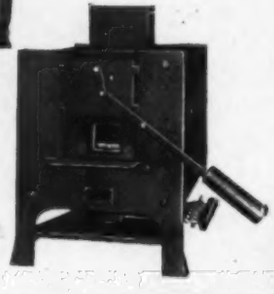

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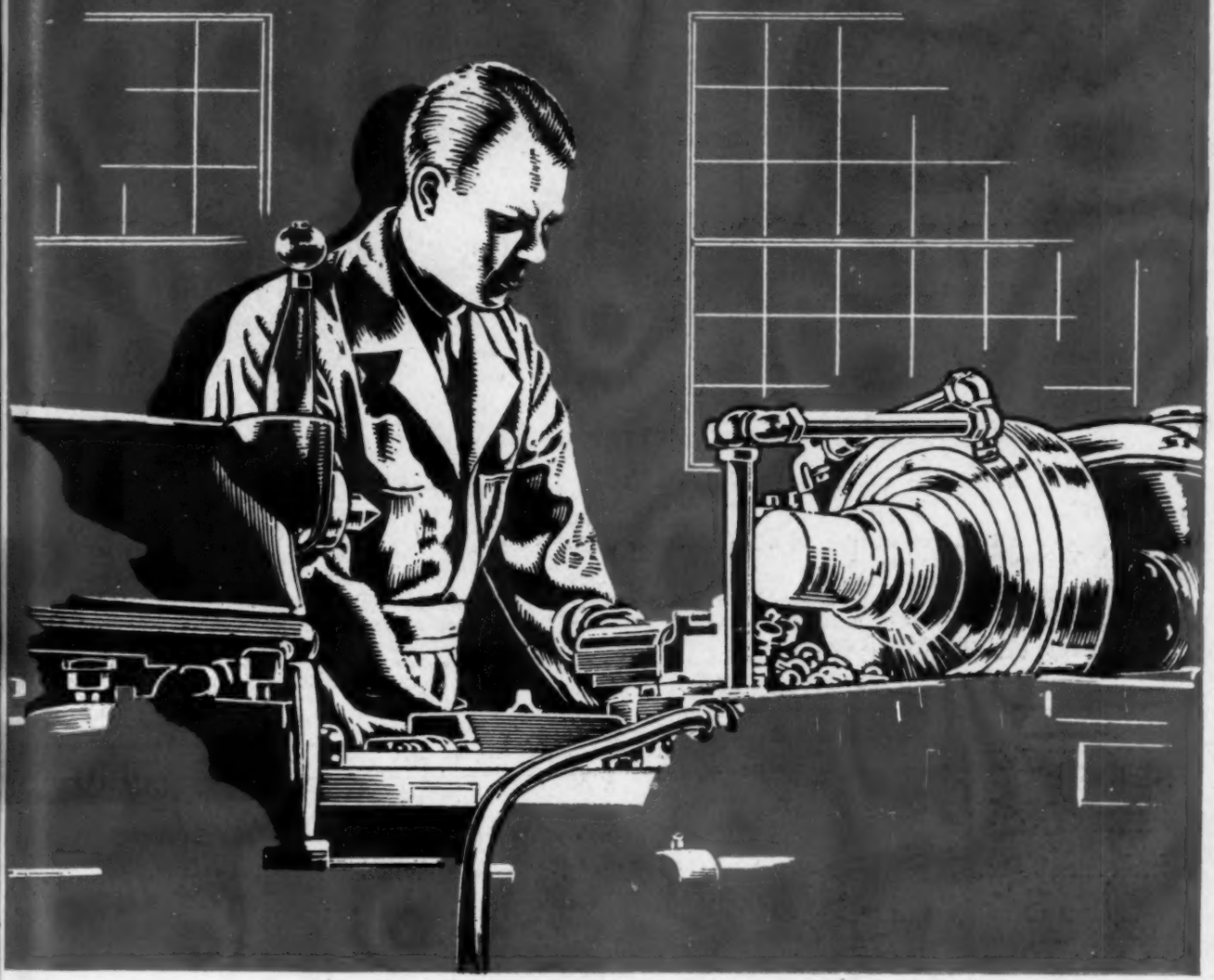

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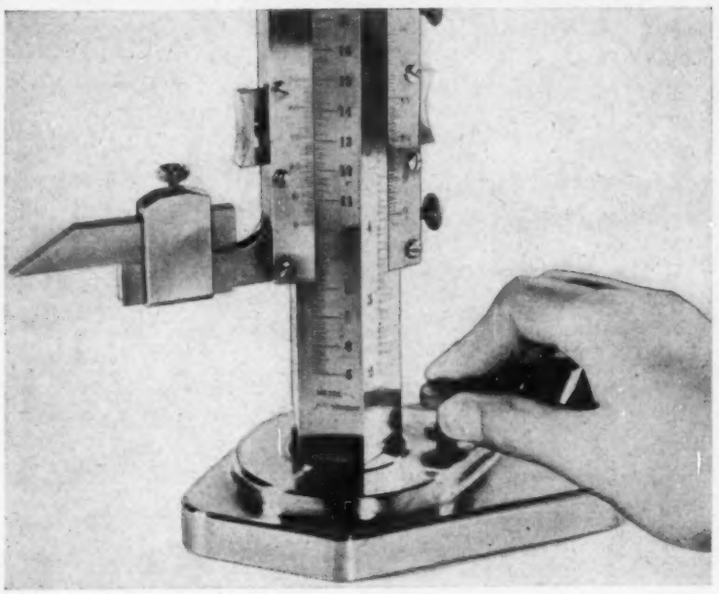

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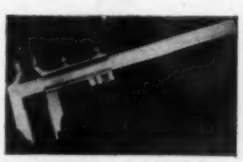

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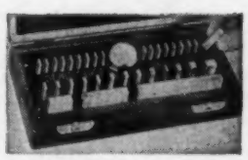

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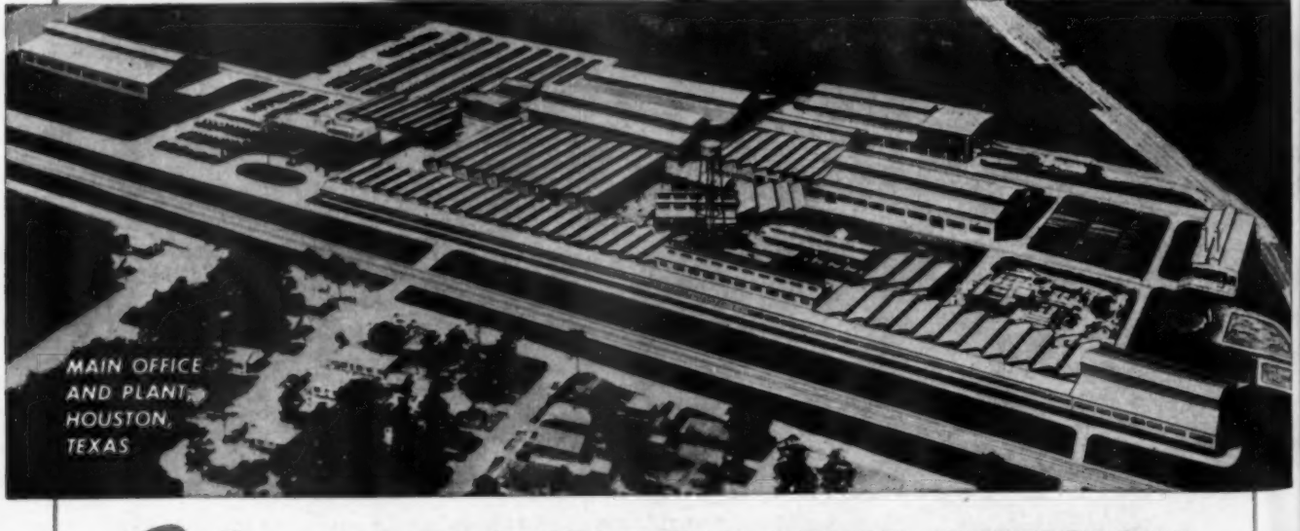

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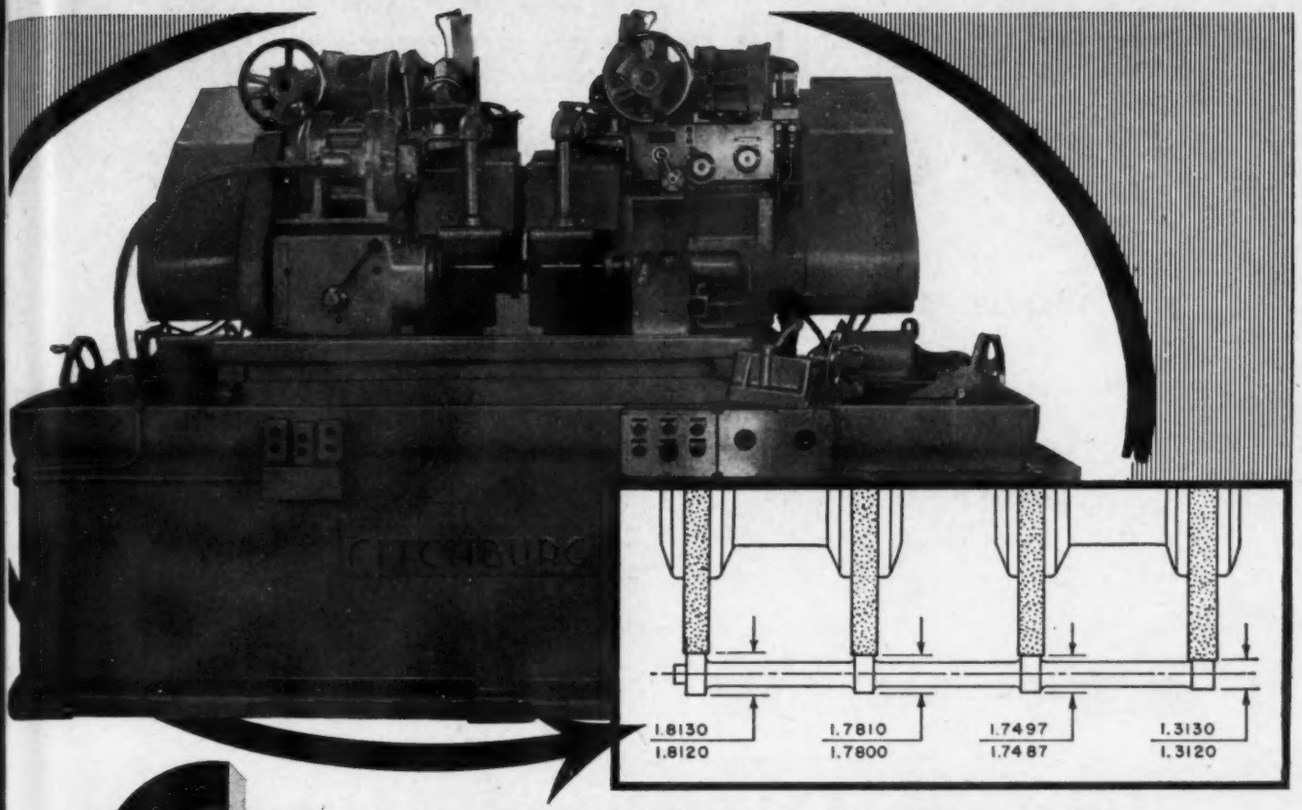

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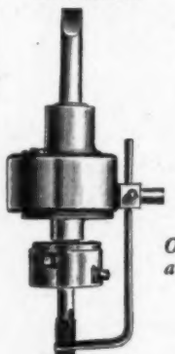

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" 0	3/16" 1/2"
" 1	1/8" 3/4"
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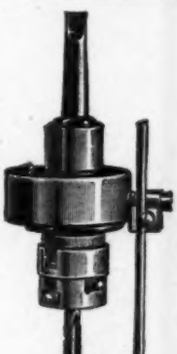
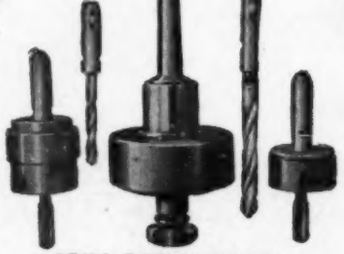


Style B Positive Stop Holds Work Down



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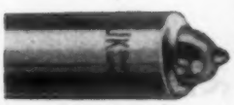

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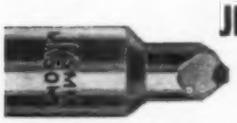

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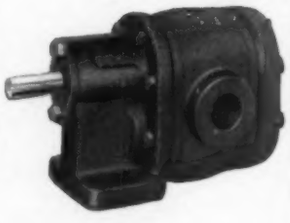

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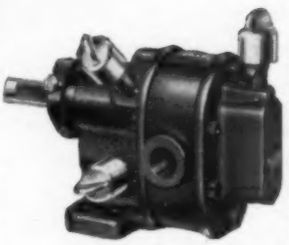

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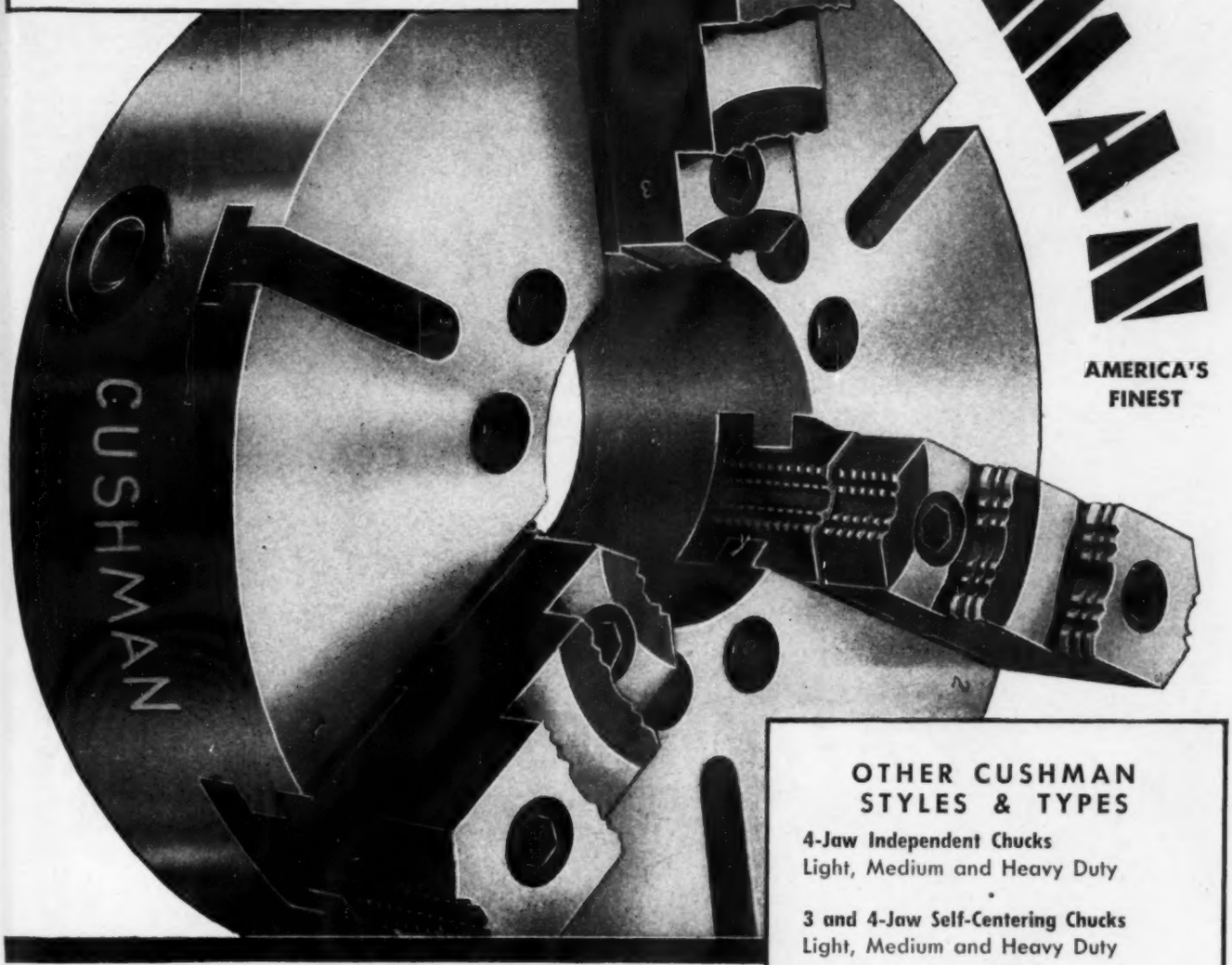

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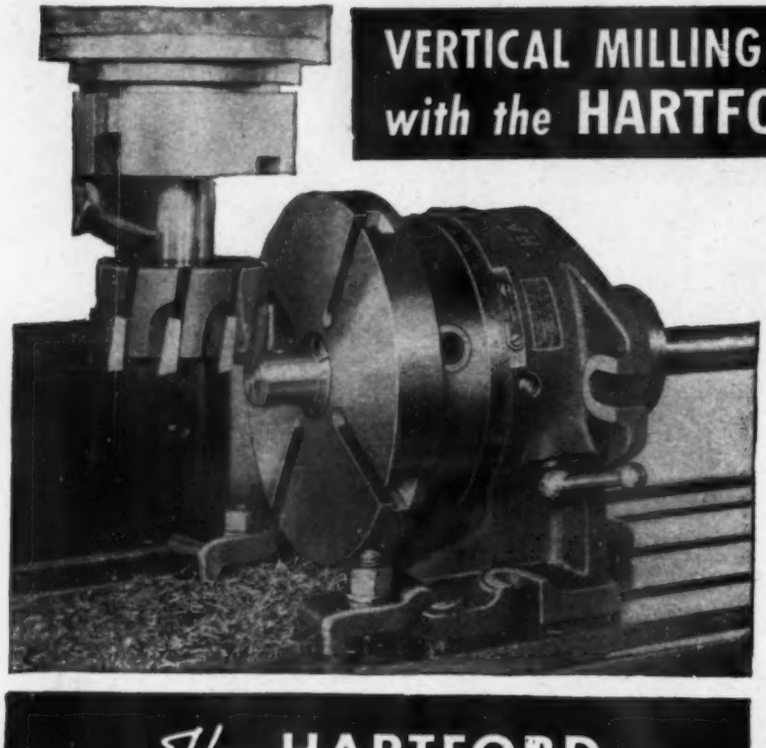

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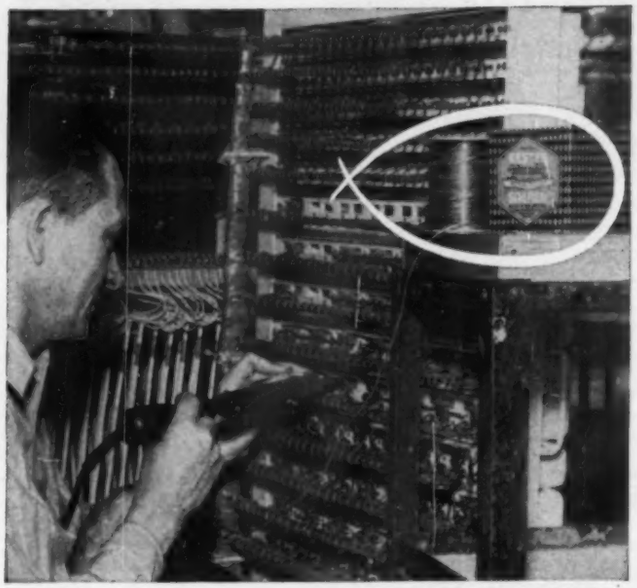

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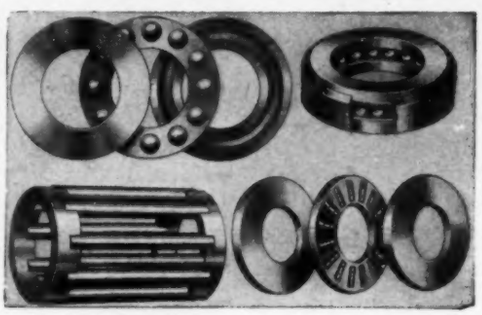

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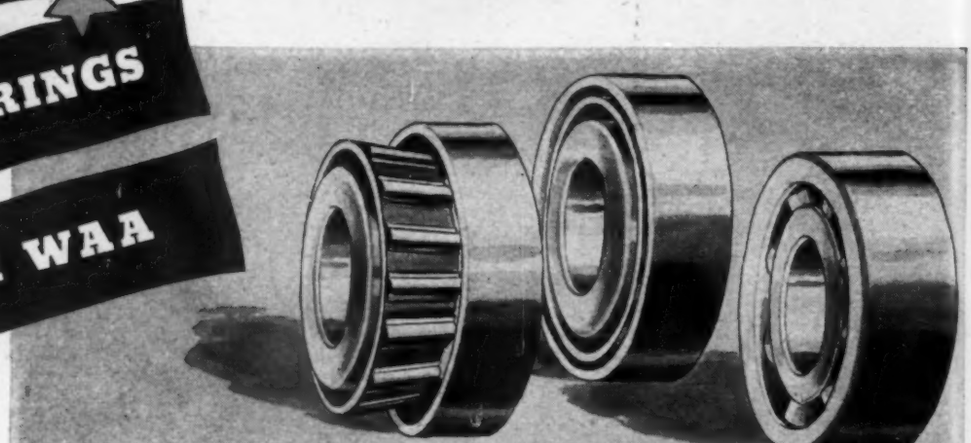

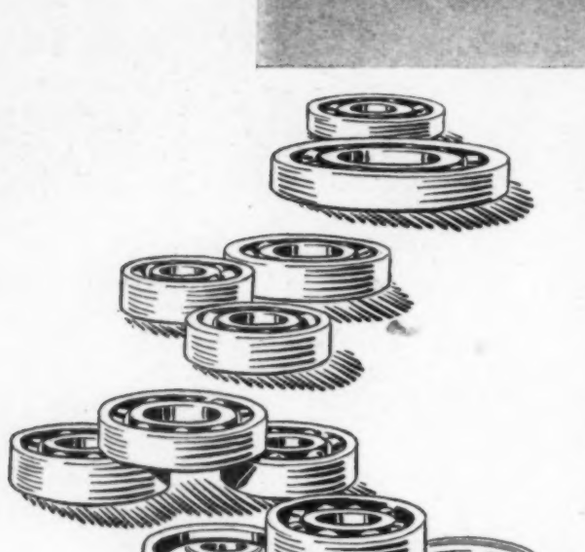

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29 Broadway New York 6, N. Y.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

WANTED — CONTRACT WORK
Metal Fabrication Manufacturer with extensive production experience has additional capacity in small welding plant. Can perform sawing, flame shape cutting, drilling and welding operations. Send your inquiries or drawings to
THE B-H CO., INC., CAMBRIDGE CITY, IND.

● Plates—Flame cut to size and shape—latest burning equipment. Can furnish our own steel—accurate work—prompt service.
● Equipped to do welding and fabricating in connection with this service. Send us blueprints or templet for quotation.
THE TOLEDO IRON AND STEEL CO.
A Complete Steel Warehouse Service
1819 STARR AVENUE, TOLEDO 5, OHIO

SEARCHLIGHT SECTION

Employment • BUSINESS • OPPORTUNITIES • Equipment—Used or Resale

SELLING OPPORTUNITY OFFERED

INDUSTRIAL DIAMOND tool and carbide grinding wheel manufacturing organization wishes to establish complete sales organization in the middle west and west coast on a representative basis. Write full particulars including financial references and industrial background. SW-949, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-seven years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Dunn Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

HARD WORKER, 33 years old, 17 years experience in medium and heavy metal working, production, inspection and sales engineering, wishes to make connection with a progressive company with opportunity for advancement, no objection to some travel. PW-950, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PLANT SUPERINTENDENT or Manager. Age 49, 20 years practical experience manufacturing light, heavy, precision, sheet metal products, tools. Dies, precision machining, stamping, forming, welding finishing, know how, mass line production, cost, continuous labor relations Salary $7200. Location immaterial. PW-952, American Machinist, 330 W. 42nd St., New York 18, N. Y.

POSITIONS WANTED

WORKS MANAGER or equivalent, 35 years old, with 21 years of successful practical experience in Machine Shop, Engineering and Administration; from Apprentice to Works Manager through all steps. Engineering training obtained in evening schools. Have demonstrated capacity to assume responsibility; quality minded, sound judgment, progressive ideas, with good health and abundant energy. Acquainted with best practice in modern machine shop practice. PW-951, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MAINTENANCE SUPERVISOR or Plant Engineer. Age 36. College 3 years. Experience 14 years in maintenance, construction, and operation of large boilers, turbines, and associated equipment. Familiar with A.S.M.E. codes and modern technique of power plant maintenance including high pressure steam-pipe and boiler welding, machine shop, and electrical. Capable of supervising all work on large boilers and turbines. Experienced in supervising men. References. PW-954, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SUPERINTENDENT, 28 years experience in Mechanical Shops. Age 48. At present employed as Superintendent in charge of punch press department. Screw machines—machine shop—tool and die—heat treating departments—incentive system. Desire change, where house is available. Best of references. PW-955, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES WANTED

EXCLUSIVE DISTRIBUTORSHIP wanted. New St. Louis Company desires to handle quality line of electrical and metal products. Will act as distributor or representative of machine tool company. RA-943, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

(Continued on page 300)

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATES

(Not available for equipment advertising)

60¢ per line, minimum 4 lines. To figure advance payment count 6 average words as a line

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS. 50 cents a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED RATE:

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A. M. June 3 will appear in the issue of June 19th subject to limitation of space available

WANTED
Mechanical Engineer

Must have technical education and experience in design and development of heavy material handling equipment as Ore Bridges and Cranes. Must be capable of rapid accurate work under general supervision only. Reply by letter only giving all relevant details as to age, education, positions held, design achievements, etc. Work located in the Pittsburgh, Pennsylvania district.

P-948, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

VICE PRESIDENT IN CHARGE OF MANUFACTURING — $15,000 Plus Bonus

A 50-year-old company with splendid reputation and distribution, with handsome finances and unfailingly profitable operations now and in the past, with no internal or external problems other than the need for a competent manufacturing executive to succeed one promoted and to bring into the capable management family the freshening influence of a variety of experience obtained elsewhere. With its largest plant in New England, a substantial one in the midwest, and 3 satellite plants on the west coast, this company employs 2500 people in copper, sheet steel, and assembly operations on industrial and consumer products of high quality but largely mass-produced.

Successful candidate will preferably be between 40 and 50, have a mechanical engineering degree or background, and have a thorough knowledge and capacity for materials management, actual metal working and assembly, manufacturing engineering, the other typical inspection and maintenance functions as well as the direction and leadership of 5 superintendents. Experience should cover both job shop and mass production. Being now employed will be a favorable factor, and must be earning above $12,000 now.

In applying give your age, marital condition, education, any other personal details you feel pertinent, and your experience in detail, indicating in the case of each position the name of your employer, the capacity in which you were engaged, the length of your service, the compensation, and your reason for leaving. While it is not a requirement or a determining factor, if you have available a recent informal photograph it would be helpful for this to be included, and it can be returned if you so desire.

Applicant answering above description cannot possibly be in organization in question, and he can be assured that his application will be held in strictest confidence until after personal interview.

P-947, AMERICAN MACHINIST
330 WEST 42nd STREET NEW YORK 18, N. Y.

SELLING OPPORTUNITIES WANTED

(Continued from page 299)

SALES ENGINEER with 25 years experience contacting mill supply and hardware jobbers throughout the middle west. Presently located in Ohio. Interested in lining up with good reputable full time line or representation for mill supply and hardware trade. Severing present connection, available soon. Excellent references. RA-944, American Machinist, 330 W. 42nd St., New York 18, N. Y

EXPERIENCED SUCCESSFUL salesman and sales executive with engineering background and varied practical production experience will be valuable to you. Available soon. SA-956, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

BUSINESS OPPORTUNITIES

Long established progressive organization, with national distribution to the wholesale plumbing and heating supply trade and having a successful background of sales, seeks an additional product of merit which is not producing sales volume and profit it should. Equitable working arrangements can be made to financially subsidize or to cary own accounts if necessary. Correspond with Harry Jaye & Co., 154 Nassau St., New York 7, N. Y.

Superintendent or Assistant Plant Manager— Thirty years experience (twelve on supervision) on tools, dies, and production problems. Broad experience on stampings, welding of all types, and plant layout. Will make investment. Prefer small or medium size shop in central or southern states. Age 47. BO-953, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

Mechanical Engineer. 20 years shop, design, and sales experience wishes to invest $20,000 and services in small going manufacturing business. BO-957, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENT and Trade-Mark Practice before U. S. Patent Office Validity and Infringement Investigations and Opinions Booklet and form "Evidence of Conception" forwarded upon request. Lancaster Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W. Washington 5, D. C.

Manufacturers' Agent in England

British subject with connections throughout British Isles wishes to represent organizations manufacturing machines and equipment for engineering industries, including mining, automotive, electrical, transport and general engineers. Would discuss possibilities of manufacturing rights in Great Britain.

RA-945, AMERICAN MACHINIST
Aldwych House, Aldwych, London, W.C. 2

SALES REPRESENTATIVE
NEW ENGLAND

Can Handle One More Line

Covering metal manufacturing plants—long established in territory—specialize on parts or raw material for production such as gears, bearings, stampings, castings, screw machine products, etc.

RA-928, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

REBUILDING

Machine service engineering 15 yrs. experience servicing, repairing and reconverting engine lathes, turret lathes, milling machines, shapers, surface grinders and boring mills.
Write or wire your problems for dependable service

F. L. ACKERMAN
346 S.W. 3rd St., Pendleton, Oregon

PETITT BROS. MACHINERY CO.

If You Want to Buy, Sell, or Trade
One Machine or Entire Plant
Consult Us Immediately
FRED PETITT — ALBERT PETITT
OFFICE AND WAREHOUSE
1240 WEST 4th ST. CHERRY 0609
CLEVELAND 13, OHIO

PROFESSIONAL SERVICES

WORLDWIDE DESIGN SERVICE

Consultants

Products—Special Machines. Processing & Tooling—Low & High Prod. Patent Drawings—Service Manuals. General Drafting. For Individuals & Small Manufacturers. A Complete Engineering Service by Mail.

P. O. BOX 224 ROCHESTER, N. Y.

FOR SALE

Seneca Falls Lo-Swing Lathe; 60" centers, hardened ways and gears, 36" carriage.

New Britain Automatic, 6 spindle, 1⅝" capacity; many extras, thread cutting.

Heavy Under-Cut Cold Saw, 9" capacity.

Acme Tapper, 4 spindle, treadle-type, ½" capacity.

Universal Cylinder Grinders: Landis 10x24 and 12x36; B & S 10x24.

ALL GOOD CONDITION . . . LOW PRICED

JAY SALTER
306 Rosedale St., Rochester 7, N. Y.

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

2—#00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle

1—#515 National Acme 9/16" 4-spindle Automatics, complete

LATHES

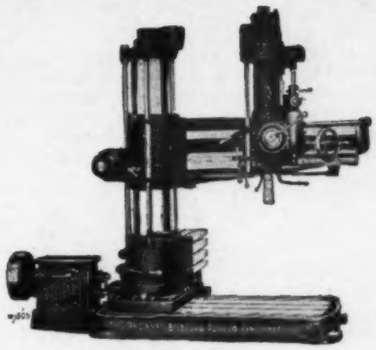
10"x24" Logan Q.C.G. Lathes (new)
Sebastian Engine Lathes (new)
14"x6' Hendey Yoke Head
14"x6' Rockford Cone drive (two)
16"x6' American Motor Driven Lathe
16"x8' Lodge & Shipley 12-speed Grd. Hd.
16"x8' Monarch Geared Head Lathe
18"x10' American, Geared Head, Taper
18"x6' American Q.C.G. motor drive
20"x10' American Q.V.G. motor drive
20"x11' Schumacher-Boye, M.D.
24"x12' LeBlond Heavy Pattern
26"x18' Bridgeford geared head
28"x10' Davis cone driven
32"x16' Bridgeford geared head

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
#3A Warner & Swasey Universal, motor drive
#4 Foster GFH Hand Turret Lathe
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe
Brown & Sharpe #1 & 2 Hand and Screw Machines

PLANERS

Betts 120"x72"x35' Metal working Double Housing Planer. Equipped with: 4 heads and power rapid traverse. With motor drive and controls, bed is 61' 3½" long
20"x20"x24" N.B.P., Planer Shaper
26"x26"x8' Gray Planer, 2 heads



RADIAL DRILLS

3½' Arm, 10" Column Cincinnati-Bickford
4' Arm, 11" Column Cincinnati-Bickford
5' Arm, 13" Column Cincinnati-Bickford
5' Arm, 14" Column Fosdick, motor drive
6' Arm, 15" Column Cincinnati-Bickford

Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

FOUNDRY MACHINES

2—#0 Johnston & Jennings, Jolt Squeezer Draw Pattern, 15"x21" Table
2—#342 Osborn Jolt Rollover Pattern Draw Moulding Machines, 23x38" Table
2—SPO Hand Rollover Power Draw Moulding Machines complete with run-out cars 22½"x60"
1—#602 Osborn Jolt Rollover and Pattern Draw, jolt cap. 900#, 36" flask length.
1—Tessmer, Sprue Cutter, 1¼" square, capacity

SHEARS & METAL WORKING

Lennox Splitting Shear, ¾" cap.; 8' throat
Lennox Bevel Shear, ¼" cap.
Peckstow 30"x18 ga. Squaring Shear
Niagara 48" Roller Leveller, 8 Rolls
West Co. 36" x 10 ga. 15" gap, Power Squaring Shear

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D
#1 Brown & Sharpe Plain Miller
P & W 2½" Duplex Spline Miller
Thread Miller, Hall Planetary #1—24"
#8 Lees Bradner Thread Miller
#1, #2 Kempsmith Plain Millers
#3B Hendey Universal Miller, motor drive
#4 Cinn. Vertical High Power Miller. (2)

GRINDERS

Blanchard Vertical Rotary Surface Grinder #16, motor drive
#33 Abrasive Vertical Surface motor drive
12" No. 22 Heald Rotary Surface Grinder
16" Persons-Arter Rotary Surface Grinder
1—Seybold 96" Knife Grinder
Oliver of Adrian Drill Grinders
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type
#2 Brown & Sharpe Surface Grinder
#70 Heald Internal Grinder
#60 Heald Cylinder Grinder
10"x18" Norton Cylindrical
2—Cincinnati, #1½ Tool & Cutter Grinders

BORING MILLS

3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36

#31 Lucas Horizontal Boring Mill, 3" bar

POWER PRESSES

2—#1A Standard Bench Type Press, ¾" stroke
#4 Bliss D. C. Forging Press
200 ton A.C.F. Hydraulic Press. Bed. 24"x36", 4-post.
Hilles & Jones #4 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 48" throat
Bliss #4¾ Dble. Crank Press, 5" shaft, 4" stroke
Bliss #76½B Single Crank Geared Press, 7" shaft, 3" stroke
Horton-Ackerly, Back Flywheel Bench Presses, ¾" & 1" stroke
Caldwell, 200 tons capacity, Hydraulic Horizontal Wheel Press
Lucas 15 ton Power Arbor Press
Bliss-Consolidated #163B S.S. Dble. Crank Press
Baxendale #4 O.B.I. Power Press, 2½" stroke

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY
Machinery Merchants

18 WARD ST.
ROCHESTER 5
N. Y.

IN STOCK—IMMEDIATE DELIVERY

LATHES

12"x21" Fay Automatic (1942)
12"x18" Lipe Carbo, Motor Drive
18"x6' American Grd. Hd.
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
42"x18' Putnam Geared Head
50"x17'cc LeBlond

MILLING MACHINES

No. 2K Milwaukee Plain (1941)
No. 4 Cincinnati Plain
No. 4 Cincinnati High Power Plain
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. Dial Type
No. 3K Milwaukee Vertical
No. 118 Van Norman Production, 18" Feed
24" Cincinnati Production
No. 27-MB Smalley-General Thread
No. 6 Lees-Bradner Thread
No. 2 Hanson-Whitney Thread
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
26"x25"x12' Ingersoll Adjustable Rail

DRILLS

No. 121 Baker, Motor Drive
No. D-8 Colburn No. 6 M. T.
No. 2 LMS—26"—1 Spdl. L-G (1944)
No. 2 LMS—20"—2 Spdl. L-G (1944)
No. 2 LMS—26"—2 Spdl. L-G (1945)
No. 2 LMS—20"—3 Spdl. L-G (1943)
No. 2—8 Spdl. Leland-Gifford
3'-11" Col. Morris (1943)
6'-15" Col. Cinn.-Bickford
6'-16" Col. American Triple Purpose
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm
7'-17" Col. American Hole Wizard (1943)
8'-16" Col. American Triple Purpose

VERT. BOR. MILLS

34" King
42" Bullard New Era
72" Cincinnati
72" Niles Extra Heavy

HOR. BOR. MILLS

No. 31—3" Bar Lucas
3½" Bar Cinn.-Gilbert, Table Type (1942)
No. 25C, 3¾" Bar Defiance, Table Type (1942)
No. 360-F Giddings & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

GEAR MACHINES

No. 3 Barber Colman (1943)
No. 7 Fellows Gear Shaper

PLANERS

28"x28"x6' Cincinnati
36"x36"x8' Woodward & Powell
36"x36"x12' Cincinnati, 4 Heads
42"x36"x12' Cincinnati

PRESS

2500 Ton Lake Erie hydraulic
No. 314 Bliss Squaring Shear

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 3 Jones & Lamson (1942)
No. 3 Warner & Swasey, bar feed (1940)
No. 1A Warner & Swasey, Preselector (1942)
18" Libby, 3½" H.S.

GRINDERS

10"x72" Colonial Broach Grd.
10"x24" Landis Universal
12"x36" Landis Univ. Type LCH (1945)
12"x48" Cincinnati Univ.
No. 22—12" Heald Rotary Surface
No. 34 Abrasive Surface
Norton Motor Driven Grinders, sizes 6x18 to 24x240

Approved WAA Dealer CHI-9

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BLVD. CHICAGO 6, ILL.

REYNOLDS MACHINERY BARGAINS

#000 Brown & Sharpe Automatic Milling Machine, (2) late type, motor driven. $394.00
10"x36" Diamond Machine Co. Surface Grinder. $250.00
Acme Universal Turret Lathe, 4½" bar feed, lot tools and collets. $900.00
14"x8' Hendey Lathe, motor drive, taper attach. $850.00
20"x6' Hendey Lathe, motor drive, taper attach. $750.00
#11 Brown & Sharpe 6"x30" Cylindrical grinder, Single Pulley drive. $400.00
(4) Waltham Thread Millers 2 x 6. $150.00
5" Gleason Gear Generator. $350.00
#0-8 Cincinnati Vertical Millers, late type, motor driven. $600.00
#0-3 Cincinnati horizontal Automatic Miller with rise and fall attachment, late type, motor driven. $750.00
10"x4' South Bend 1" collet lathe, under motor drive, bench, etc. New 1941. $750.00
#5 Abrasive Surface Grinder 14x10x48" motor in base, late type. Cost $4800.00. $1750.00
400-ton Ferracute No. EG54 Knuckle Joint Power Press. Cost new today $6750.00. $3000.00
16"x72" Norton "C" cylindrical Grinder, new never used; cost new over $18000.00.

FOR A BARGAIN WRITE

REYNOLDS
Machinery Company
303 Eddy St., Providence 3, R. I.
Tel. GAspee 5187

All Machinery Advertised Subject to Prior Sale

TOP PERFORMANCE AT LOW PRICES

NEW OBI PRESSES 35 TO 70 TON—GOOD DELIVERY

1⅛" Greenlee 6 Spld. Automatics, 1941
#1—P R & K OBI Press (2)
6 ton Fox "Superflex" Press
10"x36" NORTON PLAIN HYDRAULIC GRINDER, 1941, 5" face wheel
#2 Jackson Vertical Mill
#1 Brown & Sharpe Universal Mill, M.D.
#1B Milwaukee Univ. Mill, M.D.
11"x5' Sebastian Gold Seal Lathe GH, T.A., Motor in base
#2 Baker Keyseater, M.D.
16" G. & E. Shaper, M.D.

All these are but a partial listing. Your inquiries for any Metal Working Equipment are welcomed.

OTT MACHINERY SALES, INC.
542 Second Ave., Detroit 26, Mich.
CAdillac 3103

1—No. OG B & S High Speed Automatic, ¾" cap. with slotter, swing stop, 220/60/3 motor in base.

MONA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N. Y.

McDONALD USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive #34 M.D. Vert. Surf Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp. Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 28"x12' Lathes Monarch Model "C"
American 24'x12 grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" & 72" Vert. Boring Mills.
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Gisholt 3R Grd. Hd. M.D. Turret Lathe
W.&S. No. 2A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No. 2F Fostermatic grd. hd. Turret Lathe, M.D.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 N. B'way, St. Louis 6, Mo.

FOR SALE AT FRACTION OF ORIGINAL COST

(3) Practically New (1943) Model #48 New Britain Gridley four-spindle Chucking Machines, Chuck Vise 8".

ORIGINAL COST OF $15,000 each.

Our Price for quick removal . . . $1750.00

Machines absolutely equal to new. Can be inspected in our warehouse.

WINSTON MACHINERY CO., INC.
517 South Delaware Street
Indianapolis 4, Indiana

LATEST TYPE NEARLY NEW MACHINES

CINCINNATI 84" HYPRO Vertical Boring & Turning Mill

2 swivel heads on cross rail
1 side head
Diameter of table 84"; Maximum swing 86"
Maximum height under cross rail 72"
Motor Drive, Latest Type

BETTS (CONSOLIDATED) 84" Vertical Boring & Turning Mill

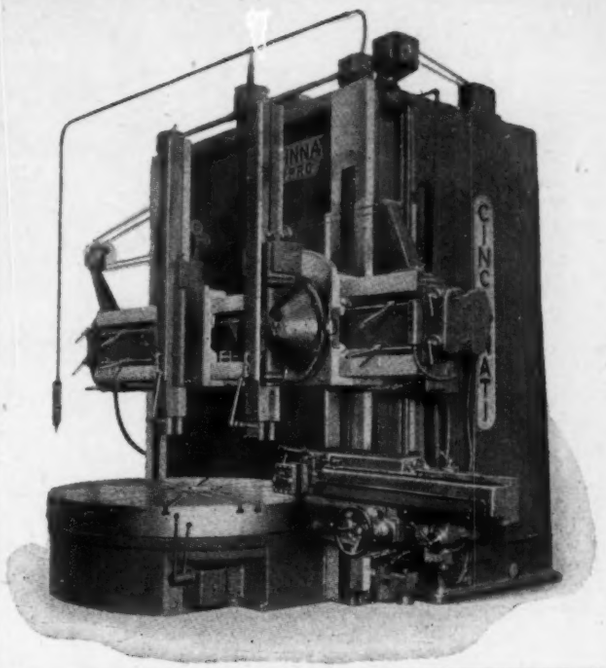
(Widened to swing 90")
2 swivel heads on cross rail; 1 side head
Maximum height under tool holder 74"
Spindle travel 30"
Diameter of table 84"
Power rapid traverse to all heads; all geared feeds
Motor Drive, Latest Type

BETTS 100" Vertical Boring and Turning Mill

2 swivel heads on cross rail
Actual swing 102"; Diameter of table 96"
Maximum distance under rail 78"
Power rapid traverse to heads
Power elevation to cross rail
Motor Drive, Latest Type

BULLARD 42" Vertical Turret Lathe—SPIRAL DRIVE—HIGH SPEED

Power rapid traverse; cutting lubricant system
Swivel turret head on cross rail
4 station side heads
Motor Drive, Latest Type



AUTO. SCREW MACHINES

ACME GRIDLEY 2" Model RA 6-spindle, Latest Type
BROWN & SHARPE #4 High Speed, 1½", Latest Type
CONOMATICS 3½"—4 spindle—latest type
CONOMATIC 2⅝"—6 spindle—latest type

BORING MILLS—Horizontal

LANDIS #35, 3½" bar, Floor Type
NILES BEMENT POND 5", 6", 7" bar, floor type
UNIVERSAL #40—4" Bar, Motor Drive
UNIVERSAL #3A—3" Bar, Motor Drive

BORING MILLS—Vertical

BETTS 120, 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, Latest
BETTS (Consolidated) 100"—2 heads, DC, Latest
BULLARD 36" N E Type
BULLARD 42" Spiral Drive, latest type
CINCINNATI Hypro, 84"—3 heads, AC, Latest
KING 36" Vertical Turret, M.D.
NILES 120", 2 swivel heads, PRT, M.D.
NILES, 73", 2 swivel heads, PRT, AC, M.D.
NILES 100", 2 swivel heads, PRT, M.D.

GEAR CUTTING EQUIPMENT

BARBER-COLMAN type "A" Hobber, latest
BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS No. 7, No. 7A type, all models, latest
FELLOWS No. 6, No. 6A type, all models, latest
GOULD & EBERHARDT 36H, 96H, with differential, M.D.
HERCULES 24" Hobber, differential, M.D.
NEWARK #5—72" Hobber, Latest Type
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUHARDT & SCHUTTE #1, #2 with differential, M.D.

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest Type
BROWN & SHARPE #5 Plain, 3x12, Latest Type
LANDIS 6x18 Type "C," Hyd., Latest Type
NORTON 16x72 Universal Hyd. Multipurpose, latest type
NORTON 16x72 Plain Type "C", latest type

GRINDERS—Surface

ARTER 30" Rotary Surface—Hyd.—latest type
BLANCHARD No. 16A—Dial Type—motor drive
BLANCHARD #27-18 M.D., Latest Type
MATTISON 12x16x48 Hyd., Latest Type
MATTISON 14x16x36 Hyd., Latest Type
MATTISON 14x16x60 Hyd., Latest Type
NORTON 10x36 Hyd., Latest Type

LATHES—Engine and Mfg.

BETTS BRIDGEFORD 60"x24' bed (raised to swing 84")
BRIDGEFORD 36"x28', 36"x32' bed—2 carriages, M.D.
HOUSTON, STANWOOD & GAMBLE 36x24' bed
LOSWING 4x60, 4x84, 8x60, 8x108, Timken Bearing, Latest Type
LOSWING 5x34" Model LR Auto., Timken, latest
NILES—42"x60", double head, motor drive
NILES 48x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x15' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 30x50' Boring, Timken, Latest Type
NILES 60 x40' Centers, heavy duty, Timken Bearing, PRT Latest Type
NILES 36x24' Centers, Time Saver, Timken Bearing, PRT Latest Type
PITTSBURGH 50'x30' bed—M.D.
REED PRENTICE 24x20' bed, AC, M.D.
REED PRENTICE 20x54" Centers, Timken Bearing, Latest Type

LATHES—Turret

CINCINNATI ACME, No. 1, No. 5W, Timken bearing, latest type
GISHOLT No. 3D Simplimatics—Timken—Latest
GISHOLT #3, 4, 5, Univ., Timken Bearing, Latest Type
GISHOLT No. 2L, Universal, Timken Bearing —latest type
GISHOLT No. 4L#9" hole—cross sliding turret —Timken Bearing—latest type
LIBBY No. 1H-5 Timken Bearing—latest—5½" hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest type
WARNER & SWASEY #2, #3, #4, Universal, Timken Bearing, Latest Type
WARNER & SWASEY No. 4A Uni., 8" hole, Timken bearing, latest type

MILLING MACHINES—Mfg.

CINCINNATI 4-36 Hydromatic, Latest Type
CINCINNATI 56-90 Hydromatic, Latest Type
INGERSOLL 48x42x16' Planer Type, 4 heads, AC, M.D.
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.

MILLING MACHINES—Plain

CINCINNATI No. 4, Timken Bearing, M.D.
CINCINNATI No. 3 High Speed, Dial Type, Timken bearing, latest type
CINCINNATI No. 5 high power, M.D.
KEARNEY & TRECKER #2HL, Timken, Latest
KEARNEY & TRECKER No. 3K, Timken, latest
KEMPSMITH No. 4 Maximiller—Timken—latest

MILLING MACHINES—Vertical

CINCINNATI #2, #4, Dial Type, Timken, Latest
CINCINNATI No. 3, No. 4 High-Powered, M.D.
KEARNEY & TRECKER 2K, 3H, 3K, 4H, 4K, Timken, latest
REED PRENTICE 3VG, Timken, Latest

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC, M.D.

SHAPERS

CINCINNATI 26" Travel Head—2 head type B
LAMAIRE 18' Vert. Hydraulic—latest type
MOREY 8", 10", 12", 14" Vertical, latest type
NEWTON 15" vert. slotter, DC, M.D.
NILES 18" vert. slotter, DC, M.D.
PRATT & WHITNEY 6' 10" Vertical, M.D.

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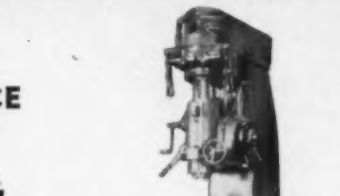
NO. 5 REED-PRENTICE VERTICAL JIG MILLING MACHINE, table 68" x 16", motor drive



NO. 3 VG REED-PRENTICE VERTICAL MILLING MACHINE and DIE SINKER table 44" x 10½" motor drive

ALL SIZES UNIVERSAL & PLAIN MILLS

VERTICAL MILLS

No. 08 Cincinnati
No. 1 Brown & Sharpe
No. 2 Cincinnati
No. 2½B Milwaukee
No. 3 Cincinnati
No. 3 Brown & Sharpe
No. 4 Cincinnati
No. 4 Kempsmith
No. 4K Milwaukee
No. 5 Becker
No. 6 Becker

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10 dies from ¼" to 1" U.S. Standard

30 taps, 3 taps each size

10 drills, 1 drill each size

2 Tap Wrenches

2 Die Holders

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(2) 100 ton Henry & Wright Dieing Press, latest design.

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UM7051—CINCINNATI BICKFORD 4' 11" Column Radial Drill, New 1941.

UM7082—Douglas Plain Miller, Model 109B, Motor in Base, Rectangular Overarm.

UM7067—PUTNAM 24"x20' Screw Cutting Lathe. Q.C.G.

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Lathe, Turret 3-A W. & S., S. P. D.
Millers, Plain No. 3 K & T, No. 4 Cin.
Millers, Vertical No. 3 B & S & No. 4 Cin.
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12"x6' bed Lodge & Shipley Selec. Head, m.d. in leg, taper, relieving
12"x84" centers Lodge & Shipley Selec. Head, m.d., taper
13"x30" centers Pratt & Whitney type B, m.d. in leg, taper
13"x48" ecnters Pratt & Whitney as above
14"x6' American Geared Head, m.d., taper
14"x6' Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x6' Springfield Geared Head, m.d. in leg, taper
14"x8' Pratt & Whitney, cone
16"x6' Bradford, cone, taper
16"x6' Hendey Geared Head, m.d.
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x30" centers Monarch Geared Head, m.d. in base
16"x54" centers Monarch Geared Head, m.d. in base, taper
16"x60" centers Lodge & Shipley Selec. Head, m.d. in leg, taper
16"x8'6" centers Monarch Geared Head, m.d. in leg, taper
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d., taper
18"x8' Champion, cone
18"x8' Greaves-Klusman, cone, taper
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley, cone
18"x8' Whitcomb-Blaisdell Geared Head
19"x10' LeBlond Geared Head, m.d.
20"x48" centers Monarch Geared Head, m.d. in leg
20"x48" centers Reed-Prentice Geared Head, m.d. in leg, taper
20"x6' centers Monarch Geared Head, m.d. in leg
20"x8' Cisco, cone
20"x8' Springfield Geared Head, taper
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, cone, taper
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' Lodge & Shipley, cone
24"x12' LeBlond, cone
24"x12' Reed-Prentice Geared Head, m.d., taper
24"x14' Boye & Emmes, cone, taper
24"x20' Lodge & Shipley, cone, taper
25"x10' LeBlond, cone
30"x26' Lodge & Shipley Selec. Head, m.d.
36"x21' centers Putnam Geared Head, m.d.
36"x28'6" centers Niles H.D. Geared Head, m.d., latest
36"x30' Lodge & Shipley Selec. Head, m.d.
36"x32' centers Putnam Geared Head, m.d.
36"x36'6" Niles H.D. Geared Head, m.d., latest
50"x204" centers LeBlond H.D. Geared Head, m.d., taper, p.r.t., latest type
20"x8' centers Lodge & Shipley Selec. Head, m.d.
24"x9' centers American Geared Head, m.d.

AUTOMATICS

No. 4D Potter & Johnston, m.d., latest
No. 5D Potter & Johnston, m.d., latest
4 spindle 7/8" Cleveland Model M, m.d.
4 spindle 2" Cleveland Model M, m.d.
2¼", 2½", 4¼", 5½", 6", 7¾" Cleveland Model A, m.d.
2¼" Gridley S.S., m.d.
4 spindle 2¼" Cleveland Model K, m.d.
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay, Flanders Type, m.d.
20x25" Jones & Lamson, m.d., latest

HORIZONTAL BORING MILLS

No. 21 Lucas, 2½" bar, m.d.
No. 31 Lucas, 3" bar, m.d.
No. 32 Lucas, 3½" bar, m.d.
No. 33 Lucas, 4½" bar, m.d.
2½" bar Cleveland, m.d.
4" bar Detrick & Harvey Floor Type, m.d.
4" bar Landis Floor Type, m.d.
4" bar Niles, m.d.
4½" bar Niles, m.d.
5½" bar Niles, m.d.
6" bar Niles-Bement-Pond Floor Type, m.d.
10" bar Sellers Floor Type, m.d.
Morton 60" stroke Boring Mill and Draw-Cut Traveling Head Planer, m.d.

VERTICAL BORING MILLS

24" Bullard New Era, m.d., with side head
24" Bullard Spiral Drive, m.d., with side head
36" Bullard New Era, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head
42" Colburn H.D., m.d., 2 rail heads
42" Bullard Spiral Drive, m.d., with side head, latest type
48" Cincinnati Rapid Production, 1 turret, 1 swivel head, m.d.
48" Colburn, 1 turret, 1 swivel head, m.d.
48" Putnam H.D., m.d., 2 swivel heads
52" King, m.d., 2 swivel heads, latest type
53" Niles, m.d., 2 swivel heads
54" Colburn, m.d., 1 turret, 1 swivel head
72" Cincinnati, m.d., 2 swivel heads
84" Niles, m.d., 2 swivel heads
100" Niles Heavy Pattern, m.d., 2 swivel heads

MANUFACTURING LATHES

No. 9 Heavy LeBlond Multi-Cut, m.d.
3½x36", 3½x80" LoSwing, s.p.d.
4x60" LoSwing, m.d., latest type
8x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest type
9x12" Sundstrand Mfg., s.p.d.
9x14" Porter-Cable Mfg., m.d.
13x24" Coulter Automatic Threading, m.d.
13x96" Coulter Automatic Threading, belt
16"x6' Cincinnati Mfg. m.d. in base
16"x6' LeBlond Rapid Production, m.d. in base
17"x8' LeBlond Auto Mfg.
17x124" centers LeBlond Rapid Production Geared Head, m.d., latest
No. 4 LeBlond Boring Lathe, 37' bed, 14'4" boring length, 13" hole thru spindle, m.d., latest type
Niles-Bement-Pond Quartering Machine, m.d., new

PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 1B LeBlond, cone
No. 1M Cincinnati, m.d.
No. 1A Milwaukee, m.d.
No 1½, 2 Cincinnati, cone
No. 2B Brown & Sharpe, m.d. in base, latest
No. 2 Cincinnati H.S. Dial, m.d, latest
No 2L Cincinnati, m.d. in base, Timken
No. 2MH Cincinnati, m.d. in base
No. 3B Brown & Sharpe, m.d. in base, latest
No 3S Cincinnati, s.p.d.
No. 3 Kempsmith, cone
No. 4B Brown & Sharpe, m.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Cincinnati H.S. Dial, m.d., latest
No 5B Heavy Brown & Sharpe Plain, s.p.d.
No. 5 Cincinnati H.P., rect. overarm
No. 5 Cincinnati H.P., Timken, rect. overarm, latest
No. 5 H.D. LeBlond, s.p.d.

UNIVERSAL MILLING MACHINES

No. 2 H.D. LeBlond, cone
No. 3S Cincinnati, m.d.
No. 4A Brown & Sharpe, m.d.
No. 4G LeBlond H.D. s.p.d.

VERTICAL MILLING MACHINES

No. 2, 3, 4 Cincinnati H.S. Dial Type, m.d., latest
No. 2, 3, 4 Cincinnati M.S. Dial Type, latest
Cincinnati Hydromatic, with 2 vertical spindles on rail
No. 2, 3, 4 Cincinnati H.P., m.d.
No. 2H, 3H, 4H Milwaukee, m.d., latest
No. 2K, 3K, 4K Milwaukee, m.d., latest
No. 2½, 3B, 4 Milwaukee, m.d.
No. 3V Van Norman, m.d., latest
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest type
No. 6 Becker, cone
No. 28-60 Cincinnati 2 spindle Hydro-Tel, m.d., latest

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Type P Ohio, m.d.
Sundstrand Rigidmill, m.d.
No. 00 Sundstrand Hydr. Rigidmill, m.d., latest
No. 0-8 Cincinnati Model EA Plain Auto., m.d., latest
No. 1-12 Cincinnati Plain Auto., m.d
No 1-18 Cincinnati Plain Auto., m.d., latest
No. 2-24 Cincinnati Plain Auto., m.d., with rise and fall, latest
No. 3A Sundstrand Copy Rigidmill, m.d.
No. 3-24 Cincinnati Plain Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d., latest, tracer control, latest
No 3-36 Cincinnati Duplex Hydromatic, m.d.
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
18", 24" Cincinnati Plain Automatic, m.d.,
24" and 48" Cincinnati Duplex Automatic, m.d.
No. CT-36 and CT-54 Lees-Bradner Thread, m.d., latest
Hall Planetary Thread, m.d.
4" Pratt & Whitney Spline, m.d.
4½x12", 6x14", 6x20", 6x48", 6x80" Pratt & Whitney Thread
10x24" Hansen-Whitney Thread, m.d.
30"x30"x12' Ingersoll Slab, m.d.
36"x24"x8' Ingersoll, 1 rail, 2 side heads, m.d.
108"x72"x26' Gray Double Housing Milling Planer, m.d., 2 planer heads on rail, 2 side heads, one removable milling head on cross rail

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★ 9/16" RA-6 Acme-Gridley Automatic Screw Machines. Bar equipment. New in 1943.
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1¼"—8 spindle Cone. New in 1942.
5½" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.

BORING MILLS

No. 31 Lucas Horizontal, m.d.

BROACHES

LaPointe CPC 24, Hyd., Vertical. New in 1945.
★ H-15-60 American Horizontal Hydraulic Broaching Machine, 15 ton capacity, 60" stroke, with 20 HP motor and control. New in 1942.

DRILLS

4' Canedy-Otto Radial Drill. New in 1946.
No. D2 Colburn, single spindle.
No. 314 Baker, single spindle.
42" Cincinnati-Bickford.
★ No. 2LMS Leland Gifford Single spindle drill, with hand-hydraulic spindle feed, motor driven. New in 1943.
★ No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectangular head 20" x 40".

GEAR CUTTERS

No. 3 and No. 12 Barber-Colman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 7125 and No. 715 Fellows Gear Shaper, m.d.
6" Gleason Str. Bevel Gear Generator.

GRINDERS

No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Intern. Grndr.
No. 72A3 Heald Gagematic Intern. Grndr.
6 x18 Cincinnati Cylindrical. New in 1943.
10 x 36 Norton Cylindrical. New in 1942.
No. 13 Brown & Sharpe Universal & Tool.
★ No. 2 and No. 3 Cincinnati Centerless Grinders, with Filmatic Spindle, some with through feed rest, others with in-feed; motor driven. New in 1940 and 1941.
★ Model B Thompson Hydraulic Surface Grinder, 10" x 24" capacity. New in 1942.
No. 35 Excello Thread Grinder. New '43.
No. 5-VRO Hammond Buffer. New 1943.

LATHES, ENGINE

12" x 30" Pratt & Whitney, g.h.
14" x 6' Sebastian, motor in base.
16" x 6' Hendey, g.h.
18" x 12' Lodge & Shipley, g.h.

No. 3616 Cleveland Rigidhobber, for spur or spiral gears, capacity 1½ D.P. in steel, maximum diameter 42", face width 16", motor driven. New in 1943.
No. 3 Brown & Sharpe Universal Grinder, capacity 14" swing x 40" center to center, with internal grinding fixture chuck, steady rests, coolant equipment, motors and controls. New in 1943.

24" x 12' Monarch helical, g.h.
25" x 12' LeBlond, g.h. New in 1941.
IMP and LR LO-Swing Lathe, m.d.
48" x 12' Lodge & Shipley, c.d.
15" x 30" Lipe Carbo-matic. New in 1943.
17" x 50" LeBlonde Production, m.d. New in 1942.

LATHES, TURRET

No. 4A Warner & Swasey, g.h. New '42.
No. 3A Warner & Swasey, g.h.
No. 1A Warner & Swasey, g.h. New '43.
No. 4 Gisholt, Univrsl., g.h. New in 1943.
No. 3 Warner & Swasey, g.h. New 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston.
36", 42" Bullard VTL, New Era.

MILLS

No. 3 Cincinnati Universal, motor in base, rectangular overarm.
No. 4 K & T Milwaukee Plain. New in 1942.
No. 4B Brown & Sharpe Plain, m.d.
No. 2H Milwaukee Plain double overarm, motor in base.
No. 2 MH Cincinnati Plain, m.d.
No. 2 H Milwaukee Vert., motor in base.
No. 2HL Milwaukee Plain, new in 1942.
No. 2 Cincinnati Vertical, motor in base, new in 1943.
No. 2209 Milwaukee Mill, table 22"x158".
No. 3-36"Cinci. Hydromatic Duplex, m.d.
No. 56-72" Cinci. Hyd. Duplex Milling Machine.
No. 6 Whitney Hand Mill.
★ 28 x 60 Cincinnati Vertical Hydro-Tel Milling Machine, single spindle with profile tracing attachment, m.d. New in 1942.

PLANERS AND SHAPERS

16" Gould & Eberhardt Crank Shaper.
20" American Crank Shaper, m.d.
★ 6" Pratt & Whitney Vertical Shaper.
No. 14 Cochrane & Bly Vertical Shaper.
36" x 36" x 12' Liberty Planer, 2 heads, box table.
42" x 42" x 20' Cincinnati Planer, D.C. Rev. M.D.

TAPPERS

No. 2X Garvin Tapper, m.d.
No. 2BG Garvin.
Leland-Gifford Radial.

MISCELLANEOUS

No. 17 Greenerd Arbor Press.

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⅞" & 1¼" Cone 4 spindle
1⅛" Cleveland 4 spindle
2"x18" Cleveland Model B
12"x63" & 14"x19" Fay
14"x18" Monarch Magna-Matic
No. 454 New Britain chucking
Gisholt simplimatic

BORING MILLS

3½" bar Universal horizontal
3½" bar Giddings & Lewis horiz.
4¾" bar, No. 300 Giddings & Lewis floor type
100" Niles Bement Pond heavy pattern
96" Cincinnati Masive Pattern
60" Colburn
50" Niles Bement Pond
24", 36" & 42" Bullard
10D Moline cylinder borer

BROACHES

No. 25 LaPointe
Twin 10 Oilgear duplex
VI Foote Burt duplex surface
3XA Oilgear
HP50 Lapointe
XB12 Oilgear duplex
No. 3 LaPointe double screw
12 ton V50 American vertical
30 ton V48 American vertical

DRILLS

4'-9" Cincinnati Bickford radial
21" & 24" Cincinnati upright
Nos. 121 & 315 Baker
24" No. 3 Allen 3 spdl., P.F.
21"x74" Munson double end
No. 00S Garvin double end
21" & 24" Cincinnati upright
24" No. 25 Foote Burt Heavy Duty
34-spdl. #30 Natco

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Nos. 8H, 12H & 16HS Gould & Eberhardt
Nos. 3 & 12 Barber Colman
Mod. T Barber Colman taper spline
No. 130 Cleveland Rigidhobber
Nos. 1, 5A & 5AC Lees Bradner

LATHES, TURRET

Nos. 4 & 5 Warner & Swasey universal
Nos. 3-B & 5 Foster universal
Nos. 3 & 5 J. & L. universal
16"x6' South Bend
Nos. 3 & 5 Foster
24" & 42" Bullard vertical
28" Gisholt
3"x36" & 4"x34" Jones & Lamson
Nos. 3, 4 & 5 Gisholt univ.

PRESSES

No. 104A Bliss horning
Nos. 56½ & 57 Toledo trimming
150 ton, No. 661 Toledo coining
400 ton, No. 664 Toledo coining
No. 2 Standard screw type
12 ton U.S. OBI
No. 4A Bliss horning
150 ton No. 661 Toledo coining
8 & 20 ton General Flexible
35 ton Metalwood straightening
1000 ton Lake Erie hydraulic

UPSETTERS

1" National
1½" & 2" Acme
3" National

MISCELLANEOUS

#10-D Moline Cylinder borer
#112-C Ex-Cell-O precision borer
Nos. 2 & 3 Cincinnati centerless grinders
No. H-1 Micromatic Hydrohoner
#211 Barnes honer
No. 9 LeBlond Multicut lathe
8", 8" and 15" Sundstrand automatic stub lathes
#12-B Pratt & Whitney profiler
Model J Radiac abrasive saw
#11-B Badger alligator shear
4" Stevens ore slotter
16" Bement Miles slotter
#2 Garvin tapper
90 KVA Fisher body seam welder

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Blueprint machines, printer-washer-dryer
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Drills, high speed single & multiple spindle
Drills, 21" Boyersford Bk. Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindles
Drill, #25 Foot-Burt motor driven
Drills—New—18" Royal Motor driven (10)
Gear Cutter, Brown & Sharpe #3—26
Gear Cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer, 24"x24"x6' Pease motor drive
Punch & Shear, two ½" & ⅝" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathe, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

THE OSBORNE & SEXTON MACHINERY CO.
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3½" Cincinnati Gilbert Horizontal Boring Mill. Floor Type.

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ONE YEAR ACTUAL SERVICE
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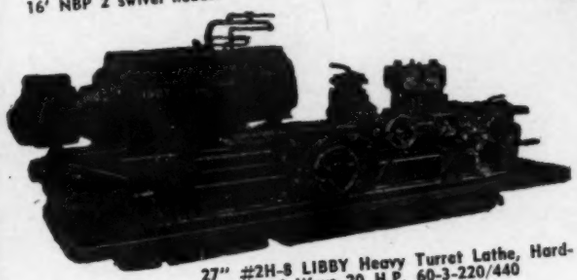
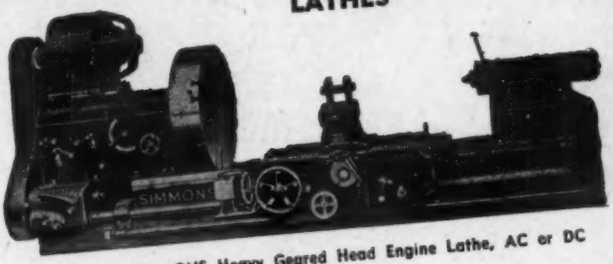


27" #2H-8 LIBBY Heavy Turret Lathe, Hardened Steel Ways 20 H.P. 60-3-220/440

LATHES



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36"x40' AMERICAN 16-speed geared head.
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#1—18" Cincinnati Plain Miller
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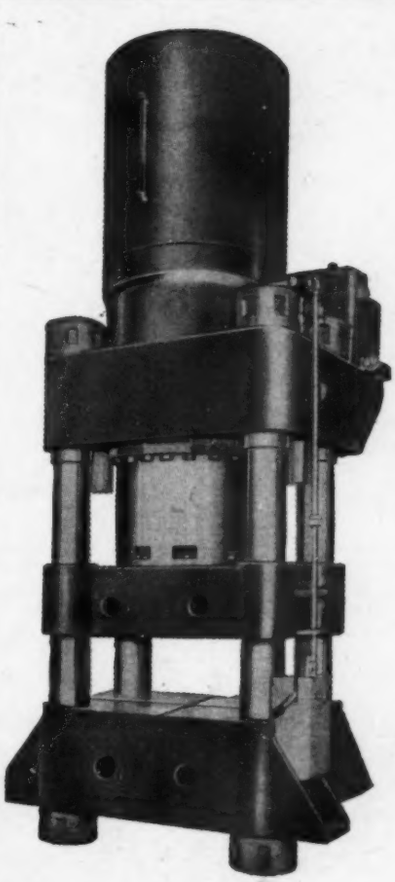

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Brand New—Bradford 12"x6', 12 speed, Timk. bear., grd. hed., motor in base.

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American 27"x16', 12 speed, grd. hed. Eng. Lathe, with taper attmt., actually swings 30½", dist. betw. cens. 11'.
1—Le Blond 21"x18' Heavy Duty Eng. Lathe, M.D., sw. over bed 21¼" dist. betw. cens. 153", mtzd.—Good condition.
Hendey 12", 14" and 16", M.D., Eng. Lathes, good condition.

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1—Lucas #43 Precision Hor. Bor. Mill, M.D., tbl. 36"x72", spin. diam. 4½", dist. from spin. nose to face of tailstock 84".
1—Niles #72 Duplex control, Horiz. Miller, M.D., 4½" bar.

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Cin. 30"x30"x12', 2 heds. on cross rail, "Herringbone gear," rev. motor drive, rap. trav.
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1—Amer. Fndry. & Mach. Co. 30"x30"x10', 1 hed. on cross rail, 1 side hed., Openside Planer, M.D.

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2—Milwaukee No. 2K pl. Horiz. Miller, with vert. hed., very latest type.

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1—Van Norman No. 2 Duplex Miller, tbl. wkg. surf. 41⅞"x9¾", power long. feed 28", cross 11", vert. 18".

1—Van Norman No. 3 Duplex Miller, high speed mill. attmt., 12 speeds, tbl. wkg. surf. 48¼"x10", power feed: long. 32", cross 12", vert. 18⅞".
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#0 Giddings & Lewis arr., M.D.
2½" Cleveland Spd.
2½", 4" Binsee
66" Niles; 54" Colburn, M.D. 2 hds.

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W & S No. 3 Grd. Hd., Univ., M.D., Late 4, 5.
Gisholt No. 1L, 2L Univ. M.D.
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36", #3.
Acme #2 M.D.

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#25 Gallmeyer & Livingston, M.D.
#25A Heald, M.D.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
No. 55, 60, 65 Heald int., M.D.
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10"x3' South Bend, M.D. Late.
Monarch, Hendey 12x30 geared head, Late
26x12' Boye & Emmes 3 step cone B.D.G.
14"x6' Hendey
9" LeBlond, P&W Auto.
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Putnam 42x16', M.D. S.C.G.
20"x19', 20"x30' Boye & Emmes Grd. Hd., Q.C., M.D.
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4' Fosdick arranged for motor drive
4', 5', 6' American Triple Purpose
4', 6' Cincinnati-Bickford
3½' Muller, M.D.; 4' 5' Western, S.P.D.

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9J Gorton Vert., M.D.
Bridgeport Vert., M.D.
No. 1 Cleveland Vert.
#12, #22L Van Norman Univ.
#2B K & T Univ.; No. 2A B & S Univ.
No. 2 Cincinnati Univ.
#2HL Milwaukee, M.D.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 2, 3, 4, Cincinnati Vert.
P. & W. No. 12, 30" Profiler M.D.
K. & T. B. & S., No. 2, 3
B. & S. No. 1, 3, Vert.
B & S #12 Elec. Prod. late type

MISCELLANEOUS
Buffalo #0 Angle Roll, M.D.
#20, 21 Bliss OBI Power Presses
Gorton No. 1S Engraving Machine 3Z, 3U
6 spindle Avey Drill 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper P & W
Oster Pipe Machines, 4", 6"
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Lennox Throatless shear ¼" cap., M.D.
Decke Engraving Mchs., G1, G2
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30"x24"x16' MATTISON Surface Grinder, M.D.
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#72A3 HEALD Plain & Sizematic, M.D.
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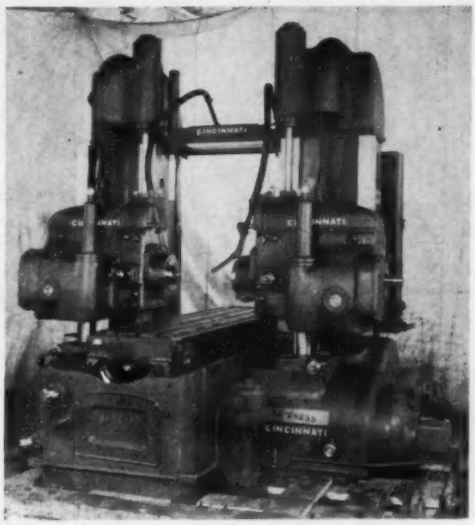
#4T SELLERS Tool Grdr., M.D.
9" P & W Hyd. Gear Grdr., M.D.
#11 BLANCHARD Rotary, 16"& 20"

LATHES

12"x30" Lodge & Shipley G.H. Lathe
14"x30" Lodge & Shipley G.H. Lathe
12"x30 Monarch Model "C" Lathe
42"x132" AMERICAN "SUPER PRODUCTIVE", M.D.
50"x17' centers LEBLOND "BIG SWING", M.D.
32"x324" centers LEBLOND LATHE, T.A., M.D. (1942)
42"x61 Ft. centers AMERICAN "SUPER PRODUCTIVE," M.D. (1942)



#5/60 CINCINNATI Duplex Hydromatic Milling Machines, tracer control mechanism for automatic rise & fall of spindle carriers, M.D., one machine used six months—one new never used.

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#1H-12 K & T Mfg., M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#3MS CINCINNATI Vert., M.D.
#3HS CINCINNATI Vert., M.D.
#3K K & T Vert., M.D.
#4 CINCINNATI "Hi-Power" Vert., M.D.
#5H K & T Plain Heavy Duty, M.D.
#12-M MOREY 2-spdle PROFILER, M.D.
#2MS CINCINNATI Plain, M.D.
#4MS CINCINNATI Plain, M.D.

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#0 B & S Wire Feed Screw Machines, M.D.
#4 W & S Ram Type Univ., M.D.
#1A W & S Saddle Type Univ., M.D.
#2A W & S Saddle Type Univ., M.D.
#3 W & S Ram Type Univ., M.D.
#3J & L Ram Type Univ., M.D.
#3A W & S Saddle Type Univ., M.D.

MISCELLANEOUS

#4½ BLISS SS, Double Action, M.D.
#36BM GOULD & EBERHARDT 3-spindle Gear Roughers.
6"x48" THOMPSON Broach Grinder.
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Nos. 2, 3, 4, Cinci. Vert. '42, '45
Model A Barber Coleman Gear Hobbers, '42
#712 Fellows Gear Generator, 1942
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P. & W. 14" Vert. B.B.
P. & W. 22" Vertical, B.B.

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Hendey 14"x6' Y.H. Fact. M.D.
American 16"x6'—G.H.
Lodge & Shipley 20"x8' G.H.
Fitchburg 60"x22' LCG

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Cin. #2 Univ.
K & T #2HL Plain
Milw. No. 2B & 3B Double Overarm
B. & S. No. 0Y Production
Cin. No. 2MH Plain; Nos. 3, 4 Vert.
Becker Model C. Vertical
B. & S. No. 3B & 5B Plain
Van Norman #2, #20
Rice-Barton 4" Spline
P. & W. 8", 10", & 12" Automatic
Cincinnati 18" & 24" Production
Sundstrand No. 1-18 and No. 2 Electromil.
P. & W. 6x14 & 6x72 Thread
Lees-Bradner 6"x36" Thread
Van Norman Duplex Nos. 0-2-20
Van Norman #2 Plain
Cincinnati #5 M.D. Plain
K&T #2K, 3K Vertical

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WF 3000 ton Hyd.

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Cincinnati—48"x48"x20' 3 Head

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Cleveland 6¾" Model A
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Borematic—Heald No. 47-A
Boring Mill—Gisholt 30"
Boring Mill—Bullard 36" & 42" New Era
Boring Mill—Bullard 100" 2 Head
Fay Automatic

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4'13" Cinc.-Bickford—2' extra height—1942 Mfg.
3'9" Avey Sensitive Radial
16" Sipp—4 spindle—T&L Dr.
16" Allen—4 spindle—T&L Dr.
16" Can.-Otto Floor & Bench—110/1/60—NEW
21" Can.-Otto—BG—Upr.—Sl. Head—NEW

GRINDERS
Reid #2C Hand Feed Surface—1942 Mfg.
6x18 Monarch Surface—Hand—Mtr. Spdle.
#25 Heald Rotary Surface—M.D.

LATHES
16/20x58" Lodge & Shipley—Sel. Head—Mtr. Dr. —1942 Mfg.
16"x6' Sebastian 8-speed—Mtr. Dr.—NEW
16"x6' Lodge & Shipley—4 speed—Mtr. Dr.—QCG
36"x15' American QCG—Belt Dr.
10"x24" Logan Bench and Floor—NEW
#2 Warner & Swasey—4 Sp. Drive—M.D.

MILLING MACHINES
Van Norman #22L—Div. Hds—Sub Hd and equipment
#2M Cinc. Plain Horiz.—Mtr. Dr.—Vert. Attach.
#2S Van Norman—Plain Horiz.—PRT—1942 Mfg.
#2A B&S Double Overarm—Universal—Mtr. Dr.—Vert. Attach.—all geared
#2MH Cinc.—Plain Horiz.—PRT—1942 Mfg.
#3 Garvin Universal—Mtr. Dr.—Vert. Attach.—Div. Hds.
#3 Cinc.—Plain Horiz.—PRT—1942 Mfg.
#3 Ohio Universal—Belt Drive
#2K K&T Vertical—PRT—1942 Mfg.
#5H K&T Vert.—1942 Mfg.
Nichols Hand—Mtr. Dr.—1942 Mfg.
Miller & Crown. Hand—Mtr. Dri.—1941 Mfg.

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16" Gemco—PRT—NEW
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28" American—all geared—SPD
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Die Filer, Harvey EL Butterfly—NEW
Planer, 30x30x8' Whitcomb—Box Bed—Mtr. Dr.

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BROACH, Vert. Hyd. SRV5-42" LaPointe.
DRILL, Hvy. Duty, No. 3½ Baker, No. 6 M.T.
DRILL, Radial 6' Cinc.-Bickford, M.D.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 14"x72" Norton
GRINDER, Plain, 24"x240" Norton, M.D.
GRINDER, Surface, No. 5 Abrasive, 14"x48".
GRINDER, Surf. Hyd., G & L, 14"x18"x72"
GRINDER, Surface, No. 25 Heald Rotary
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MASTER $38.00

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Wt. complete with crank, boxed, 85 lb.

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Welded Steel Cuts Cost 27%

By C. D. Bonifield
Vice-President in Charge of Production
The Globe Company, Chicago, Ill.

IN our development program of continually improving the designs and production of our machinery for the meat packing industry, we have found it helpful to think in terms of arc welded steel construction. This affords a highly flexible approach to our problems and the end result is beneficial to the users of our products, the welded designs being strong, rigid, light-weight and of smooth, sanitary surfaces.

Fig. 1. Dry rendering cooker of welded construction.

One design which has been changed recently to welded steel construction is the saddle for the dry rendering cooker shown in Fig. 1. Two of these saddles support the welded pressure vessel on the welded base of this machine.

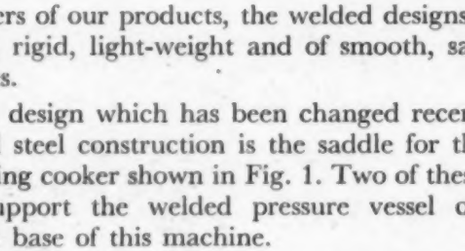

Fig. 2. Saddle support member of former design.

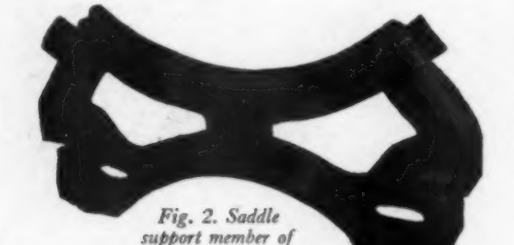

Fig. 3. Welded steel saddle costs 27% less than former design.

Fig. 4. Fixture used for assembly of welded saddle.

A saddle of former construction is shown in Fig. 2. The welded steel saddle, shown in Fig. 3, is produced at a total saving of 27% in cost over the former design.

The welded saddle, 60″ wide, 24″ high and 8″ deep, is fabricated from ½″ mild steel plate, consisting of four pieces, flame-cut and brake formed. The parts are assembled in the welded fixture shown in Fig. 4, which is placed on a work table in the flat position. After tack welding the parts together, the assembly is removed from the fixture and finish welded as shown in Fig. 5, with the saddle positioned for downhand welding of all joints. This requires continuous, two-pass fillets on both sides to join the flange to the web. The end pieces of the flange are butt-welded on both sides to the top flange assembly.

Fig. 5. Joints are positioned for downhand welding.

In approaching designing problems, our engineers have been aided by the Studies in Machine Design published by Lincoln Electric. These can be secured by writing to THE LINCOLN ELECTRIC COMPANY, Dept 215, Cleveland 1, Ohio.

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for Continuous PRODUCTION

COMPLETE INFORMATION UPON REQUEST

KAUFMAN No. 10A special Hi-Duty Tapping machine with two spindle head and eight station fixture. Same machine with fixture changes can be used for similar second operation work.

Fully enclosed . . . lead screw and nut operate constantly in oil bath . . . positively wear-proof clutches instantly engaged and controlled by air cylinder . . . quick traverse when not actually cutting threads . . . accurate depth control . . . control to protect tap overload, and further protected against jamming if work is placed in upside down . . . class 3 fits always assured and perfectly controllable.

KAUFMAN MFG. CO.
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NOBLEWEST GIVES YOU — HIGHER MARKING SPEEDS — LOWER COSTS PER UNIT MARKED

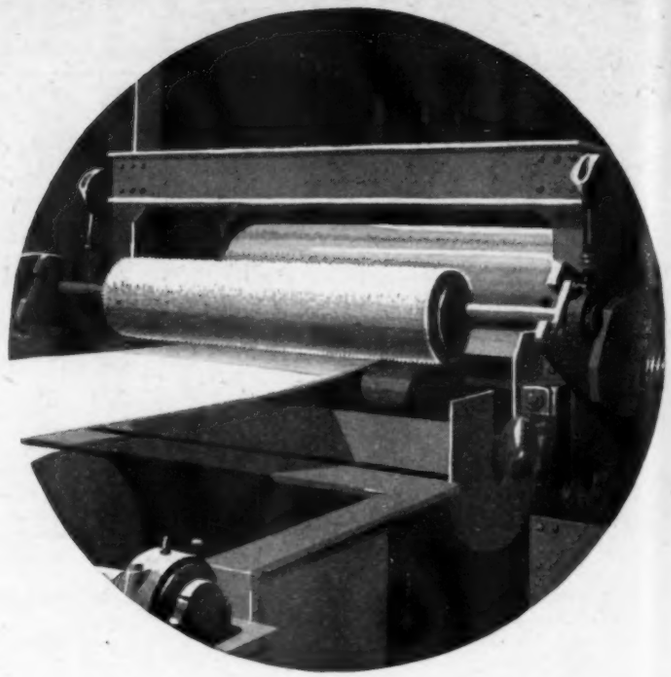
Regardless of the materials—metal, plastic, hard rubber—regardless of the size or shape of pieces, Noblewest provides you with marking equipment to do the job faster, better, cheaper. For example, Model 238, shown above, is tooled for permanently marking difficult inscriptions into plastic and hard rubber fountain pen barrels. Yet this same type of machine will also mark thin-walled metal parts of many sizes and shapes. Whatever you make—whatever the material, it will pay to put your marking problems up to Noblewest. Write Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.

MARK IT BEST WITH

NOBLEWEST

Precision Marking Machines

Every "Brush-off" has a Silver Lining!



● To change a #4 abrasive belt finish on stainless steel sheets to a perfect #6 satin finish, calls for a special power-driven brush. Pittsburgh has such a brush and its efficiency has been tested and proved by leading strip producers. ● Dense filled, medium stiff tampico brushes are used with light contact, motivating the abrasive on the steel sheets. This action prevents scratching and produces a clear, uniform surface. ● With uniform density of fill and even trim, they are built for long periods of dependable service. They can be statically balanced after being made, if required.

Why the Pittsburgh Plate Glass Company Makes Brushes

As a leading manufacturer of paints, Pittsburgh found that a reliable source of quality brushes was necessary for the proper application of its products. For over 40 years, Pittsburgh has made its own paint brushes. It was a natural step to extend its engineering and manufacturing facilities by developing production, maintenance and power-driven brushes engineered to the specific needs of industry, since many types of power-driven brushes are employed in our own production processes.

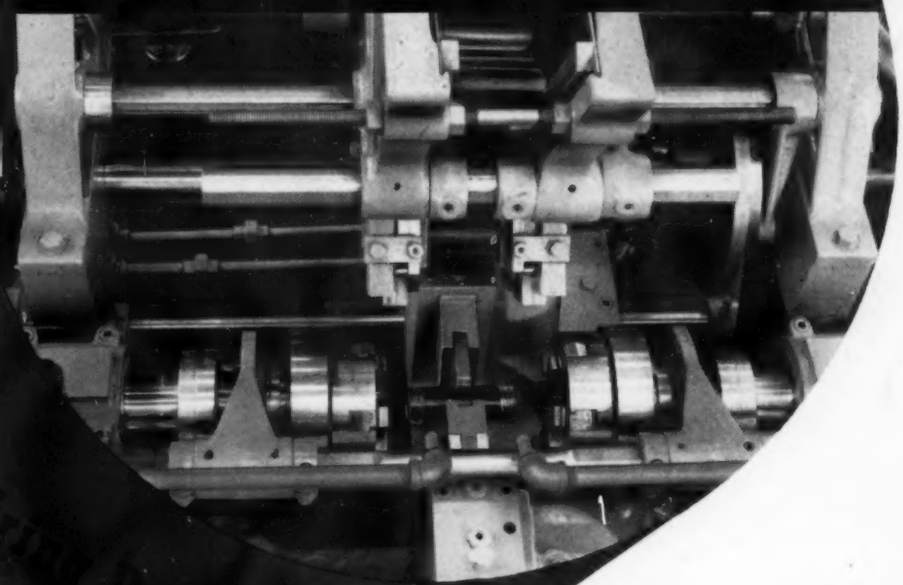
Finish up with a Pittsburgh Power-Driven Brush

● A Pittsburgh Brush does the job fast and gives you a uniformly finished product. You can depend on Pittsburgh Brushes for better performance, enduring economy, and a minimum of lost time in changeovers. In the complete Pittsburgh line are brushes of all types, including "Perfect Balance" sections, wheels and section assemblies, Uni-Fill scratch brushes, as well as paint and other maintenance brushes. ● Consult with the Pittsburgh engineering representative. He will gladly work with you in developing any type of power-driven brushes to meet your particular finishing requirements.

PITTSBURGH
PLATE GLASS COMPANY *Brush Division*
3221 FREDERICK AVENUE · BALTIMORE—29 · MARYLAND

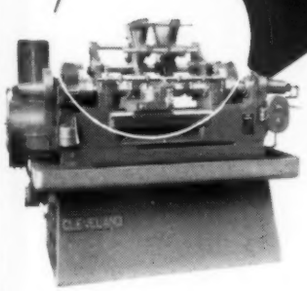
HERE'S HOW COSTS ARE CUT

A typical setup showing Cleveland Model J-2" Double-End Automatic chamfering and threading both ends of pipe nipples simultaneously. Blanks are automatically fed from magazine to center jaws. Die heads are equipped with tools to chamfer O.D. and I.D. of nipples while threading. A double set of cams produces two pieces per cycle.



in producing parts requiring Double-End turning or forming

USE CLEVELAND Model J DOUBLE-END AUTOMATICS



AUTOMATICS ... for economical, high-speed production of a wide variety of parts from tube or bar stock involving work at both ends of the piece. Typical uses include double-end threading of nipples or studs; facing, chamfering, tapping couplings or bushings; end drilling, turning shoulders, pointing or chamfering pins, dowels, and comparable pieces.

Investigate the advantages of Cleveland Model J 1" and 2" Double-End Automatics in your production. Write today for bulletin, or a cost proposal—including tooling and production estimates—on your particular job. Remember, Clevelands cut costs!

CLEVELAND AUTOMATIC MACHINE COMPANY

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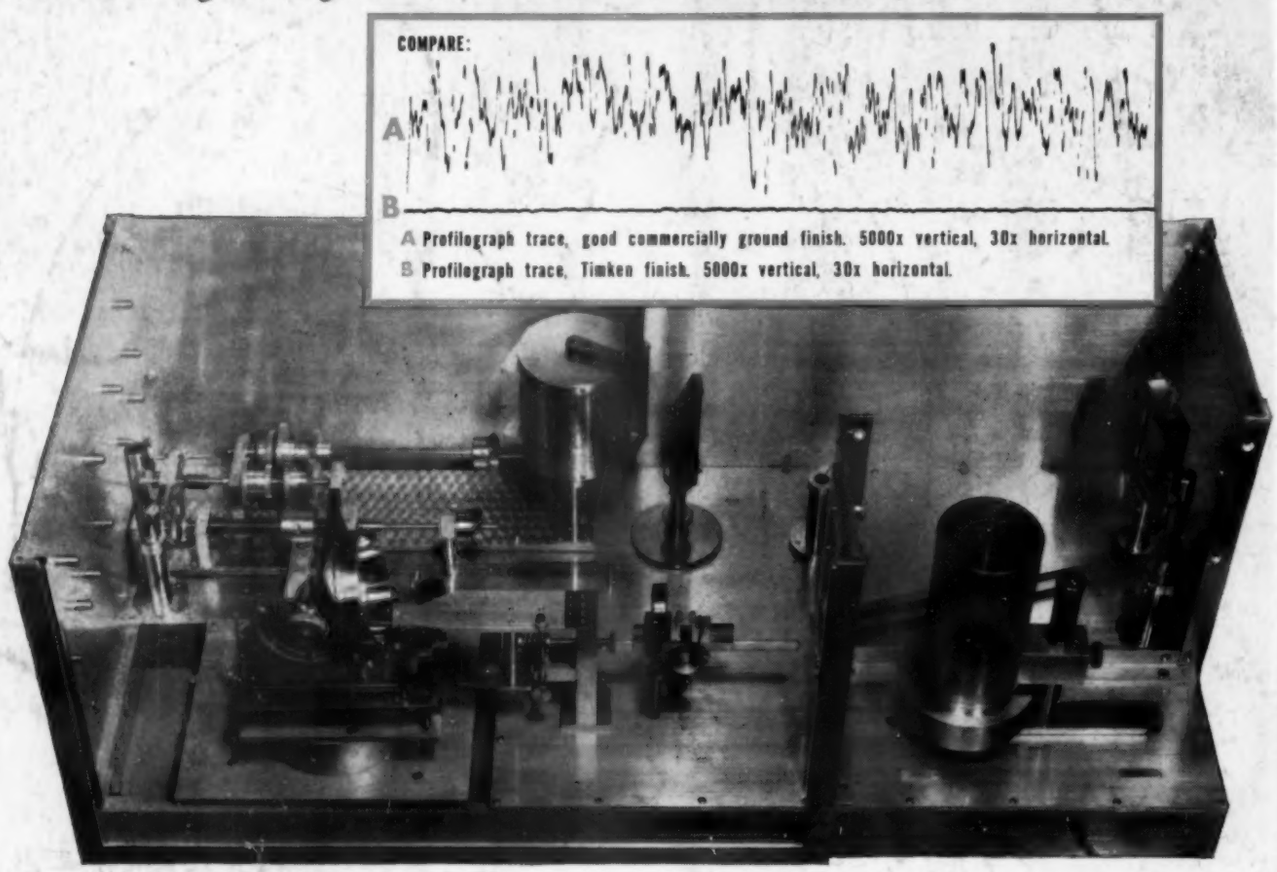
Timken bearings make good machine tools better . . . here's one of the reasons why:


COMPARE:
A
B
A Profilograph trace, good commercially ground finish. 5000x vertical, 30x horizontal.
B Profilograph trace, Timken finish. 5000x vertical, 30x horizontal.

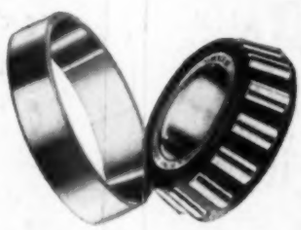
Answers the question— "How rough is smooth?"

ONE of the reasons Timken tapered roller bearings perform with such frictionless, wear-free ease is the amazingly smooth surface finish on the rolls and races —the finest known to modern bearing science.

Now, when you talk about finishes like this, you're talking about surface irregularities of only a few millionths of an inch—irregularities which are impossible to detect by any ordinary means. So, when Timken first began to develop this finish, one of the biggest obstacles was the absence of an accurate method of measuring the roughness of an apparently smooth surface.

The profilograph pictured above was the answer. Developed by Timken in 1928 and steadily improved since then, the profilograph determines surface irregularities to within one-millionth of an inch. Equipped with this measuring stick, Timken engineers were able to develop new finishing methods and machines, which have resulted in the microscopic surface accuracy of the Timken bearings you use today.

Every factor in the efficiency of a bearing is approached at Timken in this same scientific manner. For example, Timken makes its own steel to assure constant quality. And Timken is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels. No wonder you can always be sure of uniformly top quality and performance in the Timken bearings you use. The Timken Roller Bearing Company, Canton 6, Ohio.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →◎←